MANKIND AT THE CROSSROADS

EDWARD M. EAST

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MANKIND
AT THE CROSSROADS

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AT THE CROSSROADS

BY

EDWARD M. EAST

PROFESSOR IN HARVARD UNIVERSITY

WITH MAPS AND DIAGRAMS

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PREFACE

In earlier years the writer travelled trails of interest which at the time seemed rather unrelated, passing successively and perforce hurriedly from food chemistry and dietetics to soil chemistry, crop production, agricultural economics, and plant breeding. But, after all, these trails are not disconnected paths leading off from the main highway of science in different directions. They are useful portions of the web of communications available to sociology, since they are all concerned with the development of the individual human animal. And they guided him to the trail of genetics, to the study of heredity and evolution, to the problems of the race in the collective sense, a lane which he has tramped persistently and contentedly because of his faith in the vital importance of the goal to which it ought to lead.

Genetics has enticed a great many explorers during the past two decades. They have labored with fruit-flies and guinea-pigs, with sweet peas and corn, with thousands of animals and plants in fact, and they have made heredity no longer a mystery but an exact science to be ranked close behind physics and chemistry in definiteness of conception. One is inclined to believe, however, that the unique magnetic attraction of genetics lies in the vision of potential good which it holds for mankind rather than a circumscribed interest in the hereditary mechanisms of the lowly species used as laboratory material. If man had been found to be sharply demarcated from the rest of the occupants of the world, so that his heritage of physical form, of physiological function, and of mental attributes came about in a superior manner setting him apart as lord of creation, interest in the genetics of the humbler organisms—if one admits the truth—would have flagged severely. Biologists would have turned their attention largely to the ways of human heredity, in spite of the fact that the difficulties encountered would have rendered progress slow and uncertain. Since this was not the case, since the laws ruling the inheritance of the denizens of the garden and the inmates of the stable were found to be applicable to prince and potentate as well, one could shut himself up in his laboratory and labor to his heart's content, feeling certain that any truth which it fell to his lot to discover had a real human interest, after all.

This intensive work has been rewarded. Knowledge of man's nature and nurture in health and disease has been rounded out by knowledge of his racial prospects. We are therefore entering upon a new epoch of civilization with our social problems clearly and rigorously defined and with the natural laws controlling our destiny recorded on the statute-books a deal more precisely than those contributed by bar and bench. The present need is for ways and means in the practical application of this knowledge that are cautious and deliberate without being weak and infirm of purpose.

Proper direction of human evolution is a worthy objective, a high ideal which no one should censure; for whether we will or no, our complex social organization founded for the protection of the many has set at naught many of the important factors of natural evolution. But one must walk carefully and speak softly when considering recommendations along these lines. There has been too great a tendency to push ahead of the facts. Eugenics, a one-sided ill-considered eugenics, has been a veritable honey-pot for the dilettante and the amateur. They have buzzed around, circulating propaganda of a singularly pernicious type, plausible fallacies alleged to have a scientific background. Such misplaced enthusiasm does much harm to a cause fundamentally good.

From our own peregrinations in and about the subject, we have been forced to conclude that there are few undisputed facts thus far born in the genetic laboratories having an immediate practical application to the cause of human progress in the social sense. To man's economic prosperity, through the improvement of cultivated plants and domestic animals, they have contributed much; of their direct usefulness in furthering man's evolution as a rational animal, less can be said as yet. They have given us a clear-cut diagnosis of our social ills. The treatment remains to be devised.

It naturally follows, therefore, that one who has been especially interested in these subjects should have continued his search among the collateral branches of learning for facts of value in the eugenic sense, for something which he could support whole-heartedly, and could recommend to-day—not as a cure-all for every ill of the body politic, but as a practical and harmless first-aid remedy for some of the complaints. He believes this corrective is found in the control of human reproduction, the freedom of the family to build firmly for the next generation by intent rather than by hazard, the opportunity of fulfilling the social responsibility of the individual to family and to nation with due regard for the health of the mother, the efficiency of the father, the welfare of the children, and the stamina of the race. He believes, moreover, that if this remedial prescription is not generally accepted and put in practice, man's troubles will speedily multiply as they never have before.

The study of the question was first undertaken without reference to its importance in the broad sense, the relation of the increase of population to the ability of that population to sustain itself, but rather because it came to the forefront of every problem of human heredity, of every question of social hygiene, of every investigation into the physical welfare of the people individually and collectively. It began, one might say, as a eugenic or genetic inquiry. But the broader aspects continually asserted themselves. They could not be evaded. And from their consideration, a startling truth emerged. The facts of population growth and the facts of agricultural economics pointed severally to the definite conclusion that the world confronts the fulfilment of the Malthusian prediction here and now. Man stands to-day at the parting of the ways, with the choice of controlling his own destiny or of being tossed about until the end of time by the blind forces of the environment in which he finds himself. An epitome of the facts on which this conclusion is based is given in the following pages without suppression or evasion, though with the constant feeling of inability to do justice to the subject. The work is in no sense a treatise, but rather an essay designedly disproportioned in order to give prominence to the physiological and the agricultural phases of the inquiry. These phases overshadow all others in importance, yet the general tendency is either to gloss them over with a few perfunctory words or to neglect them entirely.

EDWARD M. EAST.

BOSTON, 1923.

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MANKIND AT THE CROSSROADS

CHAPTER I

A SOCIAL PROBLEM FOR IMMEDIATE ATTENTION

THERE are few things more interesting to the average person with an inclination to keep his brain in working order than the record of past steps in human progress. Even the stereotyped chronicle ladled out to the modern schoolboy, though almost wholly a Cyclopean view of dynastic changes and the wars accompanying them, holds his attention in a rather remarkable way. As long as the story is dominated by well-advertised individuals with forceful personalities and romantic careers, he will plod through it without urging. Naturally he prefers to cull his history of particular epochs by helping Locksley and the Black Knight storm Front de Bœuf's castle, or by galloping after D'Artagnan and his three companions to foil the machinations of the Great Cardinal. One cannot blame his appreciation of the masterly craftsmanship of Sir Walter and the jovial Alexandre. But the odd thing is that he will often be attracted by a narrative dry as the Sahara, if only the author is a stanch adherent of heroes and hero-worship.

It has been customary to attribute this tendency toward establishing supposed greatness on a pedestal—whether it be sharpness in roguery or greatness in good works—to the necessity of giving our mental pabulum that pleasant flavor known as the *personal touch.* But the explanation was as mystifying as the thing explained until psychology became a household word; then the seductive influence of the personal touch became clear as crystal.

The true reason, both for the method followed by the majority of annalists and for the greedy interest in their records, is one and the same. It lies in the magnificent egotism with which we are all supplied. The intrinsically unimportant story of the *Noble* few has been the most tangible material through which history could be unrolled; they saw to that. From the building of the pyramids to the franking of Congressional Records, those who had the power, through hereditary privilege or otherwise, have spent much of their time providing the opportunity for future generations to fall down and worship at their greatness. Superficially their aspirations in this respect seem to have been realized by our fascination for their deeds and misdeeds. In reality, if these bygone patricians could look into our minds they would be sadly disappointed. This hero-worship is a delusion and a snare. We offer them no tribute as of the humble to the great: we merely put ourselves in *their* place—or that of their conqueror. As a compensation for our shortcomings, as a remonstrance against a fate compelling us to hide our brilliancy, as a rebellion against the lack of power we should be pleased to exercise toward our fellow creatures, we perform a little transmigration and make the destinies of nations await our pleasure.

This is the real interpretation of the so-called human interest so manifest in the modern newspaper and moving picture. We are all alike; the impersonal has no charm; it stimulates within us no dream of power; it provides no opportunity to satisfy repressed regrets. But every schoolboy puffs out his chest and takes the place of Cæsar while toiling through his Latin lesson; and every business man leads the armies of Napoleon on a conquering tour through Europe—at least till the battle of Waterloo, when he promptly switches identity with the greatest ease and becomes the Duke of Wellington.

So far, so good. This little play-acting does no one any harm. We learn a few facts, and come to believe with childlike faith in many matters which are not fact; and we turn back to our more or less humdrum existence satisfied with ourselves and with the world. But I am fain to believe that real history ought to mean more than this to thinking men. Real history ought to be an analysis of causes and an explanation of the results that follow. Real history should be no mere record of the course of human events, but an attempt at the solution of human problems through a careful weighing of the various factors which affect the development of nations and the progress of the race as a whole. And real historians of modern times have endeavored to do this very thing. One certainly should not set oneself up as a captious critic of their efforts. Nevertheless, it is a simple fact that historical research, being an outgrowth of the old-time chronicle, has had a hard time ridding itself of useless machinery, and utilizing newer and more useful tools. As in the evolution of natural species, there has been much branching through specialization and little unification through hybridization. What I mean is that analytical history, while now taking some account of the relative importance of the events with which it deals, has held fast only to theories of government and of wealth, and has allowed the development of biological thought to escape its grasp. History, government, and economics, though ticketed separately on our library shelves, are more or less closely linked together in the minds of every one of us. This is perhaps a natural evolution. Yet man is an animal. His life, growth, and death are subject to natural laws. His fundamental instincts of preservation and perpetuation are common to the whole organic world. His very actions are determined by the heredity he receives and the environment in which he finds himself. But who among us groups the words history and biology together? Truly it was a sad day for History when this select scion was baptized Natural History and cut away from the old stock.

In spite of its disinheritance, the cadet branch of the History family has flourished like the proverbial bay-tree since it has been out upon its own. It has produced numerous descendants of which the noblest bearer of the name might well be proud. They can no longer be treated as poor relations. I submit, therefore, that the separation has endured long enough, that it is time for a reunion, when they all come together, get acquainted, and start a co-operative enterprise. Speaking more seriously, what I mean to say is this: If a coherent analysis of the activities of mankind ever appears, it will be the result of the labors of some Argus-eyed savant who is able to make a composite evaluation of the views of those who have surveyed the situation from all its various angles, and in such an evaluation the opinions of the biologist are not to be despised.

No doubt some will believe this suggestion to be superfluous, feeling that history is properly divided into three principal subdivisions, political, social, and economic, with sociology as the department in which biological analysis belongs. True, it has been divided in this way, purely for ease of work; but what I deplore is any division whatever in the final summing up that comes to our desks purporting to be a list of reasons for the rise and fall of nations. Such a segregation of causes is absolutely impossible without a distortion in the finished picture; and since the political has always dominated the other two, the result is grotesque. Furthermore, though sociology started out with the idea of giving due weight to biological facts and concepts, practically this ideal has not been fulfilled. With one or two outstanding exceptions, such as Herbert Spencer, the specialists in sociology have entered the field with preparation in economics rather than in the natural sciences. They have been sympathetic to biology, they have utilized some of the more striking of its generalizations, and they have accomplished much useful work of high merit; but being without first-hand knowledge of the facts, lacking a biological background, as it were, they have overlooked much that would have been helpful, and have fallen into numerous pitfalls they might have avoided.

In short, then, while one may have nothing but praise for the specialists in every field wherein the interests of mankind are involved, he may be permitted to point out that they are but parts of a whole, and to suggest the desirability of a co-ordination of these parts. What a history we should have if the humanists and the scientists would pool their facts: With such a text-book exploited properly we might be able to continue our social evolution with some degree of intelligent avoidance of the errors of the past.

Perhaps it will be said that Wells did this in his famous *Outline.* Undoubtedly Wells did start with the idea of lifting history out of its well-worn channel by utilizing the data from anthropology and sociology, and he accomplished a remarkable journalistic feat. But what I am asking is a revision of method of work by historians, not a new volume by an amateur—no matter how great that amateur. Wells has shown what can be done by an association between historian, scientist, and artistic writer, but his own effort is not altogether sound and unbiassed. He begins with such emphasis on man's early evolution that one expects great things, but as one turns the pages, the trained zoölogist vanishes, and in his place steps out the propagandist for the brotherhood of man. Wells has drawn various new conclusions, some of which may stand the test of time; but the popularity of his book probably rests on the interesting manner in which he has presented less well-known heroes in place of the time-worn article rather than because of a more inclusive view-point.

Let me hasten to say that these remarks are not introductory to the announcement of the present study as a part of this very desirable history of mankind's development. Reflections like these are simply the natural reactions of a biologist who is interested in social and political evolution. They are common to all biologists, for every one who has studied the science believes it has much to offer of real social value, in spite of its neglect by those who superintend the political fortunes of the world. This book has no such ambitious pretensions. What will be set forth here is merely a summary statement of how some of the natural laws to which man is subject, individually and collectively, affect his present and future happiness. It would be presumptuous even to say that neglected data are presented for the consideration of the awaited omniscient historian. The data from which the views came are certainly neglected; of this there is no doubt; but since the presentation of the view-point itself rather than a plethora of facts is the aim, the offering may be taken simply as a sample of the kind of goods biology can yield to the historian, without which his house is not well furnished.

Confessedly this work will stress biological concepts, and will emphasize some of the things that a biologist feels to be important considerations for the well-being of society; but it is not to be even a general biological view of social matters. One particular phase of social evolution has been selected for examination, because of its importance to society as a whole, and because of its direct bearing upon practical political issues and governmental decisions. It is to be a discussion of the relations between human reproduction and human comfort, the meaning of life and death to the present and to the coming generations. It is to be an analysis of the social effect of the natural increase of mankind in the collective sense, the problem that Huxley, Spencer, Garnier, and others have said transcends all other human problems, the problem that enters into all important social questions, a contributing cause of migrations and wars, a factor in famine and disease, an agent in prostitution and divorce, an element in poverty and distress. For these reasons one may venture to call it a problem of analytic history. It is indeed a truly historical topic, of interest politically, socially, and economically; but, since it can be treated effectively only by keeping in mind the established principles of evolution and of heredity, and by giving due weight to the effects of the deep-seated instincts passed on to man by the lowly ancestral types from which he came, it belongs also to biology by right of eminent domain.

The major conclusion concerning the concrete evils arising from continued population increase is certainly not original. It has been placed upon record rather axiomatically by various writers from Plato to Benjamin Franklin. It was demonstrated statistically, and maintained effectively against all comers by Thomas Malthus, before the beginning of the nineteenth century. It is kept constantly before the eyes of some small portion of the general public by the activities of the various branches of the Neo-Malthusian League, which holds out the idea of population restriction as an "ethical doctrine based on the principle of Malthus that poverty, disease, and premature death can only be eliminated by control of reproduction, and on a recognition of the evils inseparable from prolonged abstention from marriage."[1] In spite of this considerable amount of publicity, there are three good reasons for writing more on the subject, besides the obvious one that world opinion takes a good deal of coaxing even after having the facts before it.

In the first place, quantitative data pertinent to the problem have been available only during the last few years. Bookkeeping on a national scale is rather a new thing to the world, and probably is in itself evidence of the earth approaching a saturation point in terms of population. Even to-day one cannot obtain reliable figures on births, deaths, diseases, and social conditions, or on physical and agricultural assets, for any large proportion of the land area of the globe. But people are beginning to realize their importance. The wise business man has opened his eyes to the advantage of knowing accurately the natural resources of the different countries and the rates at which they are being consumed. One sees "business barometers" in every newspaper. It is only a step from this point to recognition of the necessity of constructing "metres" of public health and of national prosperity by recording facts about the people themselves.

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[1] Drysdale, C. V., *The Small Family System.* N. Y.: Huebsch, 1917.

All of the countries of the civilized world now have active departments for investigating supplies of raw materials and their rate of manufacture, and for recording the amount of land under cultivation and the crops produced upon it. Most of them are registering births, deaths, and diseases, and are studying their trend. These are changes marking a dim appreciation of the seriousness of the questions to be discussed here; but unfortunately these changes are very recent. In only one or two countries are vital statistics on record for a century, and even in these countries the earlier ones are extremely faulty. In the majority of governments where such accounting systems have been adopted, figures are available for less than a generation. The United States has been a terrible laggard in this regard. Commercial statistics are available in quantity; but, though the registration area for vital statistics is rapidly enlarging, such records for the whole population are not to be found for a single complete year.

The truth is, then, that we are just coming to be able to judge population matters by knowledge rather than by guess, owing to a more plentiful supply of facts. In addition, one is enabled to judge the facts more rigorously and to estimate the reliability of his conclusions more precisely because of scientific advance.

Second, the world has changed. The present age is totally unlike any previous age. There is no longer isolation; space has been annihilated. Whether we will or no, we must face the reality that thanks to steam and electricity the world as a whole is more of a single entity than were some of the smaller kingdoms of Europe in the fifteenth century. These new conditions call for a new survey. The pros and cons of fifty years ago are as obsolete as the spinning-wheel.

Malthus wrote about a world with less than half the population it has to-day, a world without the telephone or telegraph, without the steamboat, the locomotive, or the motor-car, and thus without the modern opportunity either for personal migration or for exchange of goods. He saw one great imperishable truth in the tendency of mankind to increase faster than its means of subsistence, and a second in the relation between overpopulation and physical distress; but he was unable of course to foresee what a great change in the immediate economic outlook of the world was to be made by inventions like those above. As globe-trotting became a commonplace, therefore, people lost interest in the dire predictions of the English rector. They saw too many square miles of fertile territory used as game-preserves by a handful of natives without cannons and rifles to become excited over the possibility of the human reproductive instinct gaining a victory over the instinct for self-preservation.

But Nature's laws are hard and fast: one can escape them only temporarily. Even Malthus would have been surprised at the rapidity of population increase made inevitable by mechanical invention, but he had too keen a mind to fall into the snare of supposing this rate of increase to be a permanent possibility. He would have seen clearly that the change in conditions was something made possible only by new tools which promoted extensive shallow cultivation of large amounts of virgin soil by relatively few men, and by cheap, rapid means of transportation for the produce. And he would have realized that such conditions must shift rapidly as these lands approach a density of population which will prevent continued exportation of food.

It is because the world *is* fast reaching the end of its land reserve, because the end is in sight, in fact, that a careful survey of the prospects is needed.

The final reason for examination of the problems of population to-day is furnished by the activities of some of the Neo-Malthusians. Statisticians, biologists, and economists, who look over their literature, cannot help but feel that they often weaken a fundamentally sound position by an emotional appeal largely unsupported by facts. They have issued powerful *a priori* arguments sustained by trenchant pens. Indeed, few social movements have had the support of such accomplished and inspiring essayists; but it is the exceptional few like Havelock Ellis, Dean Inge, and Margaret Sanger, rather than the many, who have investigated matters thoroughly and have generalized from the truths thus uncovered.

In one sense, perhaps, this comment is undeserved. Neo-Malthusians are avowed propagandists, thoroughly sincere in their propaganda, who have been under the necessity of combating old established social customs sustained by the seeker after political power and the literal-minded theologist. They have, therefore, undertaken to oppose emotion by emotion, and possibly their method is the only one capable of appealing to a large number of readers. But to those accustomed to inductive methods of approaching any subject, it seems decidedly defective. With the facts of geography, of population growth, and of present-day agriculture, available to all, an argument based upon sound quantitative evidence ought not to be neglected.

In emphasizing the importance of gathering facts carefully and putting them before the public unreservedly, I am not unmindful of a few compendia of statistical data gathered by Neo-Malthusian workers. It is the conclusions drawn from these very compilations which are so disconcerting to the critical-minded. The data may be accurate, though they one and all concern only birth-rates and death-rates, and thus neglect the importance of agriculture; but their evaluation makes statisticians squirm. Crude birth-rates and crude death-rates are compared in a very unorthodox manner. Extremely low birth-rates, wholly inadequate for effecting the desired result, are assumed to be capable of keeping a population increasing in numbers. An average length of life of seventy or eighty years is taken to be a probability in the future, without a sound basis for the assumption. All wars, all poverty, and most of the general misery prevalent in the world, are laid at the door of overpopulation.

Such exaggerated conclusions, no matter how sincere they may be, are certain to discredit the subject; and they are doubly to be deplored when an accurate analysis of the facts actually does show a high degree of correlation between population saturation and the personal distress prevalent to-day, and also leads to the decision that a world saturation in population is imminent which will make this distress international instead of local and will increase it many-fold. In other words, even if one leaves out of consideration the unscientific attitude in the matter, it is not a good business proposition to exaggerate the quality of high-class goods.

Unfortunately, every one who touches this subject is thrust between Scylla and Charybdis. If he builds up an argument piece by piece, citing all the evidence available, it soon becomes unwieldy and no one cares to read it. It has seemed advisable, therefore, in an essay designed to present only its chief measurable phases, to say some things that must be taken on faith or not at all; but no such statement has been made unless there is quantitative evidence appearing to warrant it. Naturally, questions arise on which there can be a valid difference of opinion. They cannot be avoided entirely even if it were desirable; but when they have been touched, it is after weighing carefully the evidence on both sides.

Logically, the present discussion should be divided into three heads, like the old-fashioned sermon; first taking up international relations, then examining the national situation, and finally viewing matters from the standpoint of the family and the individual.

World conditions must be given precedence, because the claim that there is a contingency existing worthy of immediate attention by those who would be called statesmen is based upon them. It is to be shown that the population of the world is advancing in a tidal wave the like of which has never before been seen. There are more than twice as many people as there were a century ago, and the rate of increase is at the peak. Unless this rate of growth diminishes with an unnatural suddenness, therefore, all of the temperate and subtropical portions of the globe will be filled nearly to the saturation point before the end of the present century; and, as in the case of ordinary solvents, additions will be cared for with difficulty. Before this time comes, the underpopulated countries now supplying food to overpopulated Europe and Japan will be working harder than they ever have before to keep their own larders filled. They will have no excess to barter for manufactured specialties, as has been their custom in the past. This fact holds within it startling possibilities. Will Europe reduce her tumorous overgrowth while opportunity for colonization still exists, in order to regain the ability to feed herself? If her people have such foresight, which is to be doubted, will they continue to restrict the population to a constant figure comfortably below the agricultural limit, or will they tend to develop an excess to be cut off by war, famine, and disease? These are two short questions, but they are about as comprehensive, politically and socially, as they well could be.

In the countries where the white race forms the dominant majority, the birth-rate is declining. Many people, on having this general downward trend brought to their attention, have become very much excited over the possibility either of a complete degeneration or of being outnumbered by the other races. No such dangers are impending. The downward trend of the death-rate in the white race is keeping the natural increase in population relatively constant; and due to the fact that this race holds all the remaining underpopulated territory, it will soon outnumber all other peoples combined. Thus there is no necessity of the white race increasing its birth-rate in a vain competition for race survival. It will survive, simply because the other races have no room to expand. Its task is to reduce the birth-rate and the death-rate in such proportions that the natural increase will diminish. What is needed in each country is a population compatible with a sound economic system, where every member of society has the opportunity of developing to the full extent of his or her capacity. This point is far below the point of full population saturation. With a saturation of population there will be jealousies and wars, and a killing individual competition; with a population below the saturation point there is no question but that all of these distressing factors in mankind's history will be much less in evidence, even though it will never be possible to eliminate them entirely.

The population situation from the standpoint of the nation and of the family, we shall not forecast. Each will be considered in its turn, and it is to be hoped that the facts presented will strengthen the contention that humanity has indeed reached crossroads where a decision must be made that will influence its whole future for better or for worse.

CHAPTER II

THE BIOLOGICAL SETTING

Let us consider the biological point of view as a theme in itself for a moment, before taking a more leisurely peep at the subject designed to orient us with regard to our special field of inquiry. We seldom stop to cast up accounts with the student of Life, and thus do not realize the tremendous field in which he is active. The common idea of the biologist is of a simple-minded eccentric person laden with a collector's trappings, pottering around through forest and field, radiant in the thought of placing a new species of animal or plant in the carefully labelled cases of some musty old museum. An interesting feat, but not one to call forth envy or emulation. And the individuals in question are so wrapped up in their own pursuits that they rarely take the trouble to cry their wares, and to explain how their study involves the life, growth, and death, the structure, distribution, and relationships, the habits and instincts, the intelligence, the physiology and pathology, the heredity and variation of every animal from the amœba to man, of every plant from the tiny bacillus to the giant sequoia. Of course a great many people realize that biology is the basis of agriculture, horticulture, and forestry, of medicine and hygiene. That is to say, they are willing to accept any objective contribution of biology which will help them over the rough places in life's pathway; but they usually turn deaf ears to any subjective suggestion which places mankind in the same category as the rest of nature and asks them to modify old established tribal habits to accord with knowledge and reason.

Vernon Kellogg,[1] writing in the *Atlantic Monthly*, says on this matter:

> I can understand, although I do not share, a certain feeling of repugnance to accepting the situation forced on us by scientific fact and logical induction. I can sympathize with, although I do not accept, the position of those who persist in wishing and trying to look on themselves and human kind in general as of a different clay, endowed with a different breath, and existing in a different sphere from the rest of life. I can feel the egocentric urge that leads to this position perhaps as strongly as those who take it, but I cannot surrender to it as easily. Scientific observation and cool reason prevent.

Unquestionably there is the difference here presented, but is not its passing merely a question of that thorough understanding which comes with familiarity? Presumably man has always been glad to accept unreservedly and whole-heartedly the help the student of Life could give him about his crops and his domestic animals; yet as late as the thirteenth century when this same student asked to be allowed to try to discover useful facts by placing the sacred body of man on the dissecting-table, he stood in danger of his life. To-day the major part of humanity has subdued this prejudice. It receives calmly biological teachings regarding digestion, respiration, and other body functions, with tacit recognition of animal relationships, and will even alter its behavior to some extent for the sake of health and comfort; but it still revolts if similar well-demonstrated facts are offered regarding the mind or body where actual genetic continuity with lower organisms is implied, and changes in religious dogma or intimate social customs like those connected with marriage are suggested.

Kellogg makes a very keen observation in interpreting this feeling. He says the difficulty lies largely in allowing one's own inaccurate and limited observations to determine his judgment regarding technical matters, which for proper understanding require a background of special training.

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[1] "The Biologist Speaks of Death," *Atlantic Monthly*, June, 1921.

He believes that the conclusions of economics and of sociology would be received more readily were every man not his own economist and sociologist. "Professors of astronomy, on the other hand, are accepted unhesitatingly as authorities—so few of us have telescopes." "The biologists," he remarks, "have a position between these two extremes. When they talk about microbes and dinosaurs their statements are accepted at face value. But when they talk about human beings, whom they can study quite as carefully as they can other kinds of beings, there are reservations. When the biologist's talk about human beings is limited to statements about lungs and liver, skeleton and ductless glands, it is not questioned. But when the talk is about the behavior of human beings, about their psychology, their heredity, their responses to environment and education, and their position in nature, then it is tested by miscellaneous personal observations and prejudices and desires and hopes and beliefs of each individual, and it is accepted or not as it confirms or contradicts each one's notions derived from these things."

There is an old Hibernicism to the effect that "one man's opinion is as good as another's, or even better," and it seems to be accepted by a large proportion of the population. It may take a long time to emerge from the sway of this egocentric habit of thought. Perhaps it will take longer in connection with the biological than with the other sciences. But the general spread of education will work this wonder, as it has many others. If the layman can let go of his belief in the sacred apartness of the human body in its ordinary functions, he can do the same when it comes to psychology. There is nothing like knowledge to sweep aside prejudice. But there are some fundamental difficulties in the way. Biology is in part descriptive and in part experimental and inductive. If Richard Roe sees a circulatory system dissected out and has the functions of heart, arteries, and veins explained to him, these are tangible facts and have a plain meaning. He has a heart himself, and has felt it beat. But when an investigator tells how he has crossed various types of guinea-pigs, followed the characteristics of the progeny to the *nth* generation, and reached various and sundry conclusions regarding their heredity, there is an antagonistic reaction. These conclusions are complex, and Richard Roe asks for simple interpretations easy to understand. Furthermore, he feels that the learned professor may be wrong. He knows from his own experience in everyday life how precarious are human judgments based on limited experience.

It is just this point, perhaps, that is the crucial difficulty in the whole matter. Richard Roe has not acquired the intimate knowledge necessary to allow him to separate the significant from the superficial; nor has he been trained to reason clearly, correctly, and to the point. Inductive reasoning on life processes is not simple, and no one knows better than the scientist himself how easy it is to stray from fact to fancy. But many a helpful conclusion has been condemned, not because it was incorrectly or injudiciously stated, but because it was applied improperly, without that caution which its careful enunciation demanded. The cure for this is secondary education. A mind trained to weigh facts carefully and accurately and to reason logically is not a great deal to ask in the way of education; but it is something rarely found in the present day.

Finally, let us not forget to mention the way the scientist and the journalist have conspired to prevent the circulation of all information more useful than knowledge of the latest domestic scandal. Interesting facts and helpful principles which might be of great aid in solving practical questions are kept as secret as the Eleusinian mysteries because our scientists have had little schooling in popular writing and our journalists have had no training in science. When one realizes what a great percentage of persons obtain their whole education beyond the three R's from the daily press, this becomes a serious matter. If publicity on the most intricate questions of a difficult science is left in the hands of dabblers who so interspice half-truth with error and fallacy that the small flavor of honest fact is smothered beyond recognition, one can hardly expect that the voice of the people on social affairs will sound so very much like the voice of God. Nevertheless, in spite of the mistakes made by the experts themselves, in spite of misunderstanding and hesitation on the part of the public, in spite of everything, biology has a message far more important than a special appeal to physician or to farmer. Biology has generalizations established beyond dispute which should determine our attitude on matters that form the very foundation-stones of the structure of society.

How many of us realize what a large part of our civilization is the growth of a night, as it were? There was a spasmodic development of culture which cannot be minimized, in spite of various and sundry dark ages in which much of the social heritage of mankind seemed by way of being lost; yet the modern development of knowledge in Europe and America which has placed this era so far ahead of previous eras is the result of an acceleration so recent it may be dated within the memory of our great-grandfathers some hundred and fifty years ago. Previous to that time the accretions to mediæval and modern learning came more slowly, being largely the result of mechanical invention empirically brought forth—though somewhat aided by several magnificent advances in mathematics and theoretical physics.

The magic wand was science, inductive experimental science, which permitted us to escape the crushing power of dogma and superstition, and to become a rationalistic race. Literature, the fine arts, and architecture have flourished these many centuries. We can offer in competition nothing which eclipses the work of hands that were still long before the Christian era. Even in thinking as a sheer intellectual exercise the ancient philosophies of China, of

India, and of Greece, have a serious awe-inspiring catholicism comparable to anything submitted by writers of to-day. But something was lacking. There was no ambition to rob Nature's storehouse of its secrets. The world had to wait many years for a man like Bacon to tell it that "the contemplation of things as they are, without superstition or imposture, without error or confusion, is in itself a nobler thing than a whole harvest of inventions." When it learned this lesson, it found the harvest increased a hundredfold.

If I had ability as a word-painter I should like to sketch the mental attitude of a representative scholarly man of the early eighteenth century, and to compare his reactions with those of a similar deputy of the twentieth century. I do not mean by this to make a comparison of abilities. There is nothing to indicate the superiority of contemporary men over the Cro-magnon man of some 30,000 years ago in inherent capacity. What I should like to do would be to show the change of mental perspective due to science as a whole and to biology in particular. But perhaps we can visualize some small portion of this great change if we leave out everything else and speak of the difference of attitude toward Life itself, provided we bear in mind how many discoveries of other sciences contributed to this broadened outlook.

The study of form and function in the individual was the first serious biological investigation of the modern type, and it led to most fruitful results. The great stimulation for this work in its early stages was the essential resemblance of the animal body to various artificial machines. Some of the principles were discovered in the seventeenth century by that small galaxy of brilliant scholars who bridged the gap between the mediæval and the modern. The function of the heart as a force-pump for the blood, the system of levers in the movement of the limbs, are examples of the simpler beginnings. The great mind of René Descartes, 200 years before its time, had almost a present-day grasp of the idea of the animal body as an efficient mechanism. He clearly recognized the subtle connection between the brain, the nerves, and the muscles, and realized that sensation is dependent upon changes in the matter of the nerves, and that movements depend on stimuli of some sort referred to the muscles by these nerves.

From such beginnings increases in knowledge came fast. I shall not burden these pages with a description of the rise and development of nervous physiology through the stimulus of Haller's experiments on irritability, the general development of anatomy, the cell theory and the rise of embryology, the growth of the physiology of the respiratory, circulatory, and digestive systems, the study of the functions of the ductless glands. It is a sufficient example of the importance of such studies to say that one of the greatest generalizations of science was made by Meyer, a German physician, through reasoning as to the cause of the lighter color of venous blood in the tropics as compared with colder climates. This realization that oxidation in the body is the source of all animal heat, led to the law of the Conservation of Energy. Thus there came about the conception that the mechanics of the organic world is in all essential respects like that of the inorganic world. The body is an efficient machine converting the potential energy of food into heat and motion under the same physical laws prevailing elsewhere.

Similarly one might dwell on the development of biological chemistry, the synthesis of urea by Wöhler in 1829, where the laboratory production of a substance formed naturally only in the animal body changed all ideas of organic chemistry, Fischer's production of simple proteins, Osborne's discovery of vitamines and the requirements of the animal body for the elaboration of proteins, or Loeb's work on the chemistry of reproduction.

The result of all this work has been the mechanistic conception of life, the recognition that helpful interpretations of life processes can be made by the simple terms found so useful in physics and chemistry for non-living matter. This conception has made a profound change in our whole mental attitude. Governmental and social policies have been altered by it more radically perhaps than by the other great generalizations which I shall presently discuss. The details of these changes one may picture for oneself; it would be aside from our main purpose to consider the matter here. There is a point in this connection, however, which cannot be neglected. The very term Mechanism has brought about a reaction, urged perhaps by the egocentric habit of thought which produces a revolution against any tendency to unify the organic and the inorganic. Two schools have grown up, the Mechanistic and the Vitalistic. The Vitalist insists on an essential difference between the living and the non-living. He maintains the inadequacy of mechanistic description for *all* properties of living matter. The battle, if it may be called a battle, has been waged wholly by the forces of the Vitalists. The Mechanist is intrenched behind pretty thick walls. Within them he goes about his business oblivious of the bombardment going on outside.

This strife has always seemed to me to be a particularly useless form of occupation caused by a philosophical type of mind that can form no true conception of the real problems of science. Of course, as the Vitalist says, the Mechanist has not explained life. Science has not explained anything. The object of science is to codify knowledge and to describe relations between phenomena in the simplest possible terms. The simplest terms found to be useful are terms of motion. And it has been found just as helpful to describe life phenomena in terms of motion as it has been to describe the movements of planets, the actions of molecules of water, or the vagaries of the electrons of radium. How far one can go in such descriptive terms no one knows. The torch-bearer of science continues to explore the cave of ignorance with faith that he can go further. When face to face with what seems to be a blank impermeable wall, he patiently seeks a path. How much better this is than to weep and wail and gnash one's teeth complaining that there is no path. As to Life itself, why worry about its origin? We lose no nervous energy over the origin of matter. Perhaps life is as old as matter. At least this interpretation has seemed reasonable to two of the greatest minds of the nineteenth century: Helmholtz and Arrhenius.

The progress in morphology and in general physiology to which we have referred not only made great changes in our general philosophy of life, it led to a revolution in the direct practical matter of living. In the latter part of the eighteenth century there was little sanitation and no real art of medicine, there was little true insight into hygiene and no knowledge of dietetics. In other than the fine arts, agriculture had made the greatest empiric progress. And curiously enough, in a sense, modern science has been least helpful to agriculture—a fact to which I shall recur again. But what a new world came into being with the nineteenth centennial! With Jenner's discovery of the efficacy of vaccination for smallpox, with Renucci's demonstration of the itch-mite as a cause of disease, with the work of Pasteur and Koch, came in a new era of medicine. Prophylaxis, parasitology, bacteriology, and immunology, new conceptions to the human race, developed with eagle speed. With the discovery of ether anæsthesia came another surgery. Practically speaking, the world has been placed on a new sanitary basis. The most serious scourges of humanity—smallpox, plague, typhoid, and malaria—have been conquered. The *span* of life has not been lengthened, but the *expectation* of life has been materially increased.

So also one might speak of the increased activity for a wider knowledge in collateral lines; the classification, life histories, and geographical distribution of living animals and plants, the improvement of these for man's use, and finally the appreciation of the fact that living organisms are but meagre samples of those which formerly existed.

These discoveries it was, taken as a whole, which paved the way for the greatest generalization of the human mind, a generalization which, taken with all its connotations, reaches every walk of life, modifies or justifies every custom, shows the reason for the past and points the way to the future—Organic Evolution.

The third decade of the twentieth century seems a strange time to speak of the inductive proof of Organic Evolution. The present generation has been brought up on the teaching that Organic Evolution is no more to be questioned than the conception that two and two are four. Yet few persons take the trouble to delve very deeply into the subject. It is merely taken as a matter of course. I recall hearing an impromptu debate about 30 years ago between a Tennessee mountaineer and three or four men of average education on the question of whether the world was round or flat. The mountaineer upheld the ancient view, and with remarkable shrewdness maintained his end of the argument. His adversaries had been given a belief to nurture, and, having accepted it, thought about it no longer. In like manner most of us have subscribed to a confession of faith in evolution, and forthwith have relegated this belief to the subconscious. Unfortunately, the ghost of the special-creation hypothesis appears to be harder to dispose of than that of the geocentric theory. It is propped up and carted around periodically by various unscrupulous and ignorant reporters who seize every opportunity afforded by the scientific discussion of the effectiveness of certain causes of evolution to display scare-heads like *The Darwinian Theory Overturned.* For this reason it may be proper to say a few words about truth and falsehood on this subject.

The conception of evolution was not new to the nineteenth century. Numerous logical thinkers from Thales of ancient Greece onward through the ages had grasped the idea. Nevertheless, to Charles Darwin goes the credit of submitting a proof that has withstood all assaults. And the thesis he so ably maintained is only 63 years old. The growth of biological knowledge of which we have spoken made it possible. Further increase in knowledge has sustained and strengthened it.

Darwin showed how the chaotic series of facts relating to geological succession of organisms, to geographical distribution of forms, to morphological similarities, to persistence of vestigial organs, to recurrence of embryological phases in such distinct groups as mammals, birds, and reptiles, to change of form under domestication, were each and all, individually and collectively, brought into intelligible order only by the assumption of the evolution of species.

Do you recall Poe's fascinating essay in his tale of Marie Rogêt on the proof afforded by cumulative circumstantial evidence? How a succession of independent events pointing in one direction finally become certainty? Well! These biological facts pointing to evolution as the master key number hundreds of thousands. Not one iota of truth is outstanding. The facts known in Darwin's time, the facts discovered since, all lead to the same conclusion. Is it a matter of wonder that those having a broad knowledge of these facts if asked which is established with the greater certainty, the probability of a past evolution or the probability of to-morrow's sunrise, will not hesitate a single moment? What has been is surer than what will be. It is because of this I have ventured to call Darwin's generalization the greatest effort of the human mind.

But here we must limit our certitude. Of the precise method by which evolution came about, one can say much less. It is a complex question, involved in subtleties. It is a question wrapped up in many subjects on which there is little knowledge—the inherent properties of living matter, the changes in the quality of the environment during past time, variation, heredity. We must base our conclusions on the grand strategy of evolution upon three great truths. Variation does occur, though we know little about its comparative magnitude, its type, its frequency, or its cause. Heredity is a certainty, and we have a fair knowledge of its mechanism built on a solid foundation of critical quantitative evidence. And, finally, selection is a mathematical requirement for the consummation of evolution about which there can be no feeling of doubt. Without selective elimination of organisms there could have been no such record of the past as we possess. Granting these premises, evolution must follow.

Darwin, with that grasp of essentials which distinguishes the first-class thinker, seized upon these truths; and finding in Thomas Malthus's *Essay* fair proof of the tendency of organisms to increase in numbers beyond the means of subsistence, supported the idea of Natural Selection as the means of eliminating the surplus least fit for survival. Even when first formulated, the doctrine of Natural Selection did not appear all-sufficient as a means of settling the HOW of evolution. Subsidiary hypotheses were suggested by Darwin himself; and subsidiary hypotheses have been put forth by nearly every general biologist following him. In part they have been stimulating hypotheses effective in bringing out new facts and in arousing new methods of study. De Vries's Mutation Theory is a splendid instance. In part they have been vague conceptions of a "force" inherent in living matter, which, evolving itself, directs the physical evolution of beings. The best example in modern times is Bergson, whose literary elegance gave him a passing ascendancy over the type of mind which clings to faith rather than to reason, but prefers its dogmas in a philosophical instead of a religious dress.

The point is that these issues are all technical problems concerning the methodology of evolution. Important as they are, they have no effect on the great generalization itself or on the conclusions one may draw from it legitimately.

Natural selection remains, and by the catholicity of the phrase must always remain, the great secondary cause of evolution, the mighty sieve through which the chaff is passed. But of the first causes, the directive agents, we are wholly ignorant. This is a matter, however, which need not concern us. It is of no immediate moment in current social evolution. There is a problem, on the other hand, that is particularly important in all considerations of the direction of human evolution. It is the old but still unsettled question of the inheritance of acquired characters. The question of whether the adaptive responses of various kinds, which in different degrees are properties of all protoplasm, can be handed on to future generations, is indeed the foremost biological riddle. In its sociological form it is this: Do the activities of the parents, either physical or mental, influence the heritage received by their children?

Lamarck, the greatest precursor of Darwin, based his whole evolutionary dynamics on the assumption that this question could be answered in the affirmative. Darwin and Spencer accepted the same answer. French biologists to the man have followed their compatriot. But Weismann, a really great logician and an extremely shrewd experimentalist, pointed out the fallacies attending all the *case* arguments of the Lamarckian school and emphasized the physical difficulties in the way of accepting its dictum. Weismann's logic and certain new knowledge in the fields of cytology and heredity gave him a great following. In England, Germany, and the United States his conclusions were accepted by almost all biologists except the paleontologists and a few psychologists. In a recent volume[1] MacDougall, the eminent English psychologist who has Lamarckian leanings, attributes the Weismannian following to German propaganda—the domination of the nineteenth-

[1] MacDougall, Wm., *Is America Safe for Democracy?* N. Y.: Scribner, 1921.

century German professor. But MacDougall lets his war emotions and his Lamarckian urge sway his judgment. Truth does not become falsehood because enunciated by a German professor. And the truth is that Weismann made the greatest single contribution of the century after Darwin to the theory of organic evolution, regardless of how the question of the inheritance of acquired characters is finally decided.

If one looks at matters fairly and squarely after a due consideration of all the facts, biology is not in such a grievous position on the question after all. Admittedly no precise answer is possible at present. Nevertheless, a serviceable proximate conclusion is not difficult. Everything is relative. Boyle's Law was useful without Van der Waal's corrective equation. Analytic chemistry still holds sway under Dalton's atomic hypothesis in spite of the electron theory. Newton is not useless because of Einstein. Similarly I believe an answer correct for all practical purposes can be given to the vexed question we are discussing. The answer is Yes!—and No! And it is not begging the question either, though such it may seem. Here is the matter in a nutshell, as it were. Much of what we see around us, the characteristics of successive geologic forms, the perfection of various useful organs, the mutual adaptations of certain species, is most easily interpreted by an affirmative answer to our query. Let us therefore admit the probability that the inheritance of acquired characters has played a rôle in evolution, at least until the future gives us a better explanation of the matter. But let us keep our minds open for this better answer if it comes. At the same time let it be recognized freely and unreservedly, that the long persistence of useless organs and the uniformly negative results of hundreds of carefully planned experiments carried on through scores of generations, tell us that such possible inheritance is so weak or so infrequent, that the requirement of time is so great, we must interpret our laboratory experiments and solve our current social problems on the assumption that *No* is the proper answer to our question.

Unquestionably the conception of organic evolution opened up more new vistas of human thought than any other proposition since time began. One of the most important of these realms of inquiry is the subject of heredity, a subject where the results are as pertinent to the social problems of to-day as are those of geometry to an architect.

A little over a generation ago, knowledge of the way in which animals and plants transmit their qualities to succeeding generations was a minus quantity, if this term can be used to express the fact that most of what people thought they knew was wrong. Heredity was a vague mysterious process only to be talked about in metaphysical terms. The WHY of heredity is still shrouded in mystery like the WHY of gravitation, but the HOW of inheritance can be described in words as precise and with formulas as exact as those for the phenomena of chemistry or physics. And this advance has knocked the last support from the belief in the sacred apartness of the human animal. The mode of inheritance is the same for the flowers of the field and the birds of the air, for cauliflowers and cats, for donkeys and dunces. With slight variations, due in many cases to known causes, the mechanism of heredity is one and the same throughout the vegetable and the animal kingdoms wherever sexual reproduction obtains. The laws of sexual heredity are the laws of Mendelian inheritance, and, paradoxically enough, sex is transmitted by the same process.

Why do our eyes have their respective colors? Why does each of our respective organs arrange itself now in form like that of one parent, now in form like that of the other parent, and again in the form of that of a collateral relative? Why are some people brilliant and others stupid? The answers to such questions are to be sought in the behavior of small bodies contained in the nuclei of the germ-cells which are known as *chromosomes*. These chromosomes are constant in number and in form within each species. Each body-cell contains two sets, one from the father, and one from the mother. These bodies are little automatic freight-cars in which the units of heredity, the genes, are packed in an orderly manner like beads on a string. They are carriers of potential characteristics which they offer for the use of the new organism in its process of development. Through their qualities the characters of the individual are what they are.

At the formation of the germ-cells, eggs, or sperm, one and only one—it is a matter of chance which one—of the members of each successive chromosome pair goes to make up its complement. At fertilization these two sets of chromosomes again come together. And the careful tracing of thousands of separate characters through many generations has shown us what it is we are to expect in the new generation.

Many of us who are laboring in this field feel that public knowledge of the far-reaching results obtained is much too narrow. A superficial acquaintance with Mendelism is expected to-day of every schoolboy. He is taught that heredity comes about by the mechanical process through which the elementary units, the genes, are passed along, that they are transmitted independently of one another, that they are relatively stable bodies, and that variations appear only when one or more of them undergo a change in constitution. He knows that a single gene has an effect in the production of many body characters, marked in some and slight in others, that many separately heritable genes are at work in the building up of every body organ, and that "breeding true" for any characteristic means receiving like genes for that characteristic from both the father and the mother. He can tell how one may cross a tall red sweet pea with a dwarf white variety, and obtain the new combinations, tall and white, and dwarf and red, in definite ratios from the progeny of the hybrids. He can even predict the ratios. But what he does not know, and what the scientists appear to have neglected to tell the general public, is how these facts affect the human race directly and personally; yet this is just what it ought to know, especially the judge who passes on the foibles of his fellow man, the legislator who outlines his rules of conduct, and the social worker who tries to lift him to better things.

Perhaps this situation arose because the public wants the path made too easy; possibly it is because the student of genetics has not tried to smooth out as many bumps as he could smooth out if he put his mind to the task. I do not know. Genetics assuredly has its difficult points; heredity is not quite so simple as laying bricks. But the general principles are not more complex than those of auction bridge, and are a good deal like them. The phenomena of heredity are the result of permutation and combination, they follow the laws of choice and chance.

Let us set down answers to a few of the social questions constantly arising, to show where the knowledge takes us. Why are there black peoples, yellow peoples, and white peoples? It is because in early times families left the patriarchal fireside, wandered away in various directions, and established themselves in different climes. As time went on, some of their many hereditary units changed, and thus produced numerous variations, both physical and mental. When these variations prevented or deterred their possessors from flitting along life's highway and leaving descendants, they disappeared, leaving no record of their existence. Their germ-plasm with its peculiar qualities ceased to exist, just as perhaps did the germ-plasm on which depended the wonderful combinations of qualities which gave a Golden Age to Greece. But some of these changes gave their holders a handicap over the others in combating the environment in which they found themselves. They persisted, outbred the older type, increased in numbers, and founded new strains of mankind. There is definite evidence that thousands of such differences now separate the primary races; though it is obvious that hereditary units, presumably much more numerous, are common property of all.

Individuals also differ, not only in those genes which make one tall and another short, or build one a Roman nose and another a saucy pug, but also in units which make one a genius, one a mediocrity, and one a dullard. Great gaps separate the races. There are huge series of hereditary units possessed exclusively by each. Thus the white race has developed intellectual qualities superior to the black race, though the black race can resist malaria much better than the white. But though racial differences are such as to set average levels of performance for each, which may distinguish the one from the other, individual differences are broader still. In mental capacity, for example, there is a much greater variation within the white race than between the mean levels of the white and the black.

The mention of inherited mental capacity may come as a surprise, but it should attract no special comment. Psychologists have erected several notable landmarks within their domain, and with each new discovery there is less distinction between the physical and the mental. In physical attributes it is found that heredity fixes the potentiality of development within narrowly defined limits; environment determines matters definitely within these limits. If the parental gifts are right, the children will be tall; their exact height will depend upon their food, their work, their rest, and recreation. Similarly, mental attributes are inherited; whether these potential abilities are fully developed or remain partially dormant depends upon circumstances.

The work of Goddard[1] has shown how the common type of feeble-mindedness is due to some sort of deficiency in a single gene, and that it is transmitted as simply as blue eyes or albinism. Psychological and genetical studies have developed that above the degree of feeble-mindedness exist numerous grades of inherent intellectual ability of which the transmission is no more complex than that of stature.

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[1] Goddard, H. H., *Feeble-Mindedness: Its Causes and Consequences.* N. Y.: Macmillan, 1914.

This conception of inherited capacity is very interesting, for it tells both why superiority may run in families and why the intellectual giant may come from average stock, why marriage between cousins may be bad and why it may be distinctly good. Besides the heredity units common to the race, there are others—doubtless hundreds upon hundreds—by which individuals differ. Some of these make for brilliancy, some for crass stupidity. The average man has an average collection of the good, the bad, and the indifferent. The superior man has received one of the various combinations in which the good qualities greatly outnumber and outrule the bad, and different kinds of superior men result from the different existing possibilities for combining these hereditary gifts. The simple-minded dullard, on the other hand, has been so unfortunate as to have received more than a fair share of the bad and less than a fair share of the good.

Since the average man has received numerous pairs of unlike genes from his two parents, it is easy to see that in many of these pairs one may be good and the other bad; hence it follows that when his germ-cells are formed they will not be all alike in potential qualities. In a few there will be extraordinary combinations making for superiority, in the majority there will be the mediocre average such as he himself received, while in another few there will be a potency of inferiority. If this man marries a woman with a similar variability of germ-cell constitutions, their children will have different endowments; and there is the chance —rare as it may be—of two particularly good combinations uniting to give a particularly good result, the genius.

Though good *can* come out of Nazareth, and a superior son or daughter shine out like a beacon in the dull twilight haze of a mediocre family, nothing is more certain than that this will always be the exceptional occurrence. The germ-cells of the capable individual are not likely *all* to possess that individual's potential capacity, but they will be *more numerous* than in the case of the commonplace person. *This is because a person who receives a pair of identical good genes from his two parents will transmit these good qualities in every single one of his germ-cells.* As the stockman says, he breeds true for these qualities. Thus families, or strains, arise having combinations of characteristics for which they breed more nearly true than most, making them better—or worse—than their neighbors. There are the Peabodys, the Emersons, the Lowells, the Lees, and Edwards, high-grade families leaving permanent records in the Hall of Fame, on the one hand; and the Jukes, the Nams, and the Zeros, with a conspicuous history of crime, pauperism, and general worthlessness, on the other.

Most of us are hybrid for many of our good genes; that is to say, we have received bad mates for some of our good potentialities. If, therefore, we marry close relatives, bad characters are likely to appear in some of our progeny, due to the meeting of these bad genes whose effects had been masked by the power of their better mates. But the probability of such an eventuality diminishes with the length of the record of continuous high performance along our ancestral line. Inbreeding good stocks in some degree is the way the stockman gets his prize-winners.

Probably no one would recommend the risk of much inbreeding, even in the best of families, since there are possible black sheep—as one might put it—among the germ-cells of every strain; but I firmly believe the time will come when every man who has any brains will use them to scan with care the biological family history of the individuals with whom his children propose to marry.

Insight into the exact mechanism by which these events come about is not difficult if one makes a little effort at mental concentration. Let us ask the question whether marriage between the black race and the white race is a good thing, and answer it by the genetic facts rather than from the emotional dictation of race prejudice. Our premises are that the two races differ by numerous heritable qualities, that on the whole the white race is the superior, but that the black race does have some very desirable characteristics. The problem then takes the form of whether there is a reasonable possibility of obtaining a combination of the good qualities of both types. The answer is No! not even if the most stringent selection were possible, which does not happen to be the case. The reason is as follows:

Human beings have a good many of these gene-carriers, the chromosomes. There are 47 in the body cells of the male and 48 in the female; thus the egg-cells all have 24; while half the sperm-cells have 24, and the rest have 23. When one of the 23-type fertilizes an egg-cell, a male results; when it happens to be one of the 24-type, a female is produced.

For convenience, then, let us suppose there are always 24 pairs of chromosomes packed with heredity units in the body cells of both males and females. The mulatto resulting from this hypothetical racial cross has a set of 24 from each parent, somewhat as if he had received 24 black dice and 24 white dice with which to play the game of life. When this individual grows up, the young immature germ-cells go through a process of coming to maturity by a reduction division whereby one chromosome of each pair goes to each finished germ-cell, the potential half-child. Now suppose that there is only one promising combination. We will say that it is like the choice of 18 particular white dice and 6 particular black dice. The chance of obtaining this one choice to the exclusion of all others is one-half to the twenty-fourth power. It is one chance out of numerous billions of billions; practically it is no chance at all.

Of course there may be a great many good combinations instead of only one; but the probability is hardly worth the risk, even if this simple type illustration were all there is to the heredity mechanism. Unfortunately, there is a still greater complication in the shifting around of the heredity units in the formation of the germ-cells, and then the process is only half finished: two properly constituted germ-cells must meet at fertilization before obtaining the desired result. Thus there are two needles in the haystack, and it is required to get them both at one haul.

The complication arises from the fact that the genes themselves have a definite architecture within the chromosome. The chromosomes cart away the genes to the daughter cells at the proper time, in just the manner described; but the genes themselves are packed away by the hundred in each chromosome like beads on a string. And there is a particular phase during the time of germ-cell growth when the members of each chromosome pair have the opportunity of exchanging their freight with each other. But there must be a fair exchange. If bead number one is given by the paternal chromosome to the maternal chromosome, the maternal chromosome must give its original bead number one in exchange. The usual practice is to exchange these beads as portions of the string; and this is an important phenomenon, fraught with serious meaning. *It means that the heredity units carried within each chromosome tend strongly to be inherited together.* That is to say, it is a rare case, a most improbable case, when all the good genes go together. The maternal chromosome gives a string of four good genes and three bad genes to the paternal chromosome, and receives a string of three good genes and four bad genes in return. Since, therefore, in the hereditary endowment of every individual the genes are very numerous, the possibility of getting all the good genes together is about the same as the possibility of dropping dollars at intervals while crossing the Atlantic, and picking them up on the way back.

These truths gleaned from the genetic laboratory show plainly, without other explanation, why extreme racial crossing is inadvisable, why immigration of human derelicts without inherent capacity is undesirable, why our almshouses and other benevolent institutions are filled with a submerged tenth which we ought not to allow to grow into a larger fraction. They give the reason why there should be different treatment of the congenital morons who make up the majority of our paupers, our ne'er-do-wells, and criminals, and point the way to a means of preventing the increase in their numbers which, if continued, means the downfall of national prosperity and social ruin. They mark a burden of *noblesse oblige* for the fortunately endowed compared with which Kipling's White Man's Burden is insignificant; but they also show how this task can be lightened.

Having made this short incursion into matters biological, what insight has been gained as to the relation between biology and world affairs? Logically, the most general conclusion should come first. It is this: Mankind is not an assemblage of beings especially designed to rule creation. They came up out of the past, and they drag the past up with them. Social proposals, political schemes, governmental policies, in which this fact is lost to sight are foredoomed to failure.

Social idealism has sought to draw up rules of conduct advertised as having a biological basis, in which much is heard of the "brotherhood of man." Well and good! So there is a brotherhood of man. But even the slogan itself savors of the egocentric impulse. What one needs to realize is that all altruistic teaching stands only such chance of success as exists with the recognition of the more elementary fact—cousinship with our companion the dog, collateral heirship, so to speak, with both the patient donkey and the ferocious tiger. By this simile I am trying to emphasize the fundamental truth that the human qualities setting us off from the lower animals are *parvenus;* the most firmly ingrained instincts, the absolutely basic instincts, are infinitely older and much more general.

The work of Freud, Adler, Jung, Kaempf, and others in analyzing the subconscious self, the real self unrestrained by the conventions of civilization, has demonstrated beyond a doubt the thinness of the veneer of culture; that is, if we need a demonstration while Lenin still lives and there are memories of the *Lusitania* and Herrin. Sumner was able to show how the petty details, the insignificant points of life, become the Folkways of social custom, so difficult to change; the psychoanalysts went further along one of the trails he opened, and showed why the really petty has so much significance.

It is because Nature is not to be denied. The instincts whose development were prerequisite to evolution, the qualities that have come down to us through countless generations of four-footed ancestors and even farther, are not to be eradicated because of an artificial gloss put on like a coat of varnish during this momentary phase of our existence known as the historic period.

The dominant animal instinct is the instinct of survival or self-preservation. It is the fundamental basis of all evolution. One sees its analogue among the lower animals in the innumerable devices for personal defense against enemies, in the natural weapons of offense, tooth and claw, horn and hoof, in power of adaptation to different conditions, in ability to close up wounds or to regenerate limbs, in modes of reaction against parasites or of acquiring immunity to them. Along with the other animals, man has developed and retained many of these physical aids to survival, and being a reasoning animal he can see, if he does not unconsciously deceive himself, how mental life and social custom have also been built up in accordance with this urge.

Latterly a great deal has been written about evolution through co-operation. Too often these essays are written by those who, straddling the horns of a dilemma and conscious of it, try to camouflage the difficulties involved, and by dint of many words succeed in deceiving even themselves. The dilemma is indeed of a subtle type. Mankind in common with numerous other species all along the ancestral tree of the animal kingdom adopted co-operation. In other words, they banded together individuals of their own species to show a united front against other species. They adopted *e pluribus unum* as their motto because it seemed a good way to protect the individual. Presumably this was the best plan; though because it has worked in the case of man, one cannot attribute his success wholly to it. The ox adopted it also; the lion did not. After adopting it, to give it workable rules, came the development of moral ideas. These are folkways or customs guarding man's system of defense. They have been supported in numerous ways. On the one hand, legal codes have developed, with temporal rewards and punishments; as secondary defenses, beliefs in eternal compensations and atonements have been evolved.

As a result of the complexities which have thus arisen, many persons fail to realize the cause of the development of moral ideas. They invert the order of cause and effect, and having pictured a world as they think it ought to be through faith in what they believe to be a fundamental moral instinct, they forthwith propose and support ideas which run counter to the old survival instinct, and are thus foreordained to failure. To put the matter in a word: altruism can develop only so far as it does not run too far counter to individualism. Man will help his neighbor if in the long run he helps himself, virtue is not its own reward, we are more or less honest because being more or less honest is the best policy. These are words which bring about a feeling of repugnance, but unfortunately they must be used when describing the world of our experience instead of a dream-world of idealism. He who stops to analyze the causes of capitalism, of unionism, of patriotism, of ambition, of industry, will be convinced that they are true words. If perchance he is not convinced, let him read that remarkable book by William Graham Sumner entitled *Folkways*. He will find out something about the sources of his daily actions that will astonish him. But he need not be ashamed, for there is dignity in selfishness. The foundation-stone of the marvellous diversity of the whole organic world is not a matter for cheap disdain.

The other imperious instinct is that of reproduction. Emerson said: "The preservation of the species was a point of such necessity that Nature has secured it at all hazards by immensely overloading the passions, at the risk of perpetual crime and disorder." The fundamental nature of the sex instinct is no less apparent in man than in the lower animals. It is held in conventional restraint, it is often sublimated and idealized, but it is even more constantly manifested in man than in any other species. Consider our literature, our drama, our moving pictures, our art. One theme and one theme alone is present—love. If one turns to the study of the tribal customs of uncivilized races, one sees no equivocation in the matter. It is presented boldly and with pride. The Christian religion, or at least St. Paul's interpretation of the Christian religion, made of the sex instinct a thing to conceal, a thing of secrecy and silence; but this has modified it not a whit. If psychoanalysis had rendered no other service, it at least served a purpose in showing how the full force of sex remains unmodified in the subconscious no matter how changed its appearance in the conscious life.

Here then emerges the great point at issue. In physical form, in physiological function, and in fundamental instincts, mankind is linked with its evolutionary past. The horizon has broadened, the scope of action has enlarged, but the animal relationships are there. Let us then cease to try to deceive ourselves about them Let us admit the limitations imposed upon us by the instinct for self-preservation, by the instinct for race-preservation, and by our inheritance as individuals, and let us try to make as good a world as possible, built upon truth instead of fiction.

These remarks are particularly pertinent to the subject of population. The survival instinct makes one feel that life is worth living, and advantage is taken of every discovery in order to prolong it. This leads to an increase in population. The reproductive instinct tends toward the same end—more and more people. Thus there comes a point when the instinct for reproduction runs counter to the instinct for survival, since people can multiply only up to the subsistence limit of a given type of industrial effort. The human race is therefore confronted squarely with a choice in procedure. It is a choice between being consistent and being inconsistent in interfering with Nature.

By the irony of fate this choice is forced by a constantly nearer approach to an ideal, the pursuit of happiness for one and for all. Early man struggled along with few comforts, and was cut off in his youth by war, famine, and disease. His descendants are more fortunate. The marvellous progress in the science of mechanics has made possible a material comfort amounting to luxuriousness, while biological discoveries have reduced pain and prolonged expectation of life. By thus moulding the environment to his choice, man has provided for and invited more people, and they have come. But what is to be the reward of these efforts at happiness when the world as a whole is fully peopled? Nature's laws will make no allowance for human desires. Either population must be consciously restricted to a point where individual happiness throughout a long life is possible, or civilized man will be no better off than man of the Stone Age, for he will be repressed in exactly the same way.

When one considers this dilemma carefully, he is astounded at the breadth of action it invites. Consistent international policies must be inaugurated if the evils of war are to be reduced. Either there must be a peaceful solution of the population question by the adoption of wise measures, or a continuation of the policies of Alexander, Napoleon, and Bernhardi.

National policies also must be regulated by a consideration of these basic facts and principles if nations are to endure. The *laissez-faire* doctrine is gone forever, and intelligent thought is united in being glad to see it go. Humanly directed experiment may be dangerous, but its possible rewards are worthy of the trial. It is self-evident, however, that the hand once put to the plough cannot draw back, since change in one direction necessitates change in another. There ought to be changes in all directions where definite knowledge makes it desirable; or Nature should be allowed to take her course. No one will deny that certain social changes are badly needed now to permit a progressive social evolution. The trouble is that we busy ourselves urging superficial doctrines which do not touch the heart of the matter. The truth lies deeper. Medical effort and social charity have enlarged the meshes of the sieve by which Natural Selection has done its work. Incompetents are saved and are encouraged to increase their kind. What society ought to do is to provide more adequately for the education and encouragement of its most able sons and daughters. Generosity in this respect would pay real dividends. Charity of the present type, where more of the public money is spent on the imbecile than on the genius, is of rather doubtful value. The final result would appear to be a proportion of imbeciles sufficiently high to guarantee decadence and dissolution.

Francis Galton coined the word eugenics to stand for part of what I mean to imply in suggesting a revolution in social policy. The term is literally less broad than I should wish, and has been so misunderstood, so bandied about by the self-complacent and the wag, that I hesitate to use it at all. But a broad, all-inclusive eugenics, or social hygiene, as Havelock Ellis would say, seems to me to be the answer to the question: Are we to have a better civilization or a worse? See how it touches every phase of social life. The birth-rate, the disease-rate, the death-rate are not merely of interest to the individuals concerned; or even to the physician and the public-health officer. They are intricately mixed up with immigration, with the race question, with distribution to city and to farm, with the food-supply, and therefore with basic economic conditions. The distribution of life and death among the various elements of the population is of even more importance, for this determines the trend of racial constitution. Indirectly, because of inherent differences in potential ability between individuals, it even embraces matters of education and of legal responsibility. Directly, *it is the index of whether there is to be race degeneracy or race progress.* It is therefore the *sine qua non* of the whole social system.

"Looking back over the history of mankind," says MacDougall,[1] "we see that it consists in the successive rise and decay of great civilizations. Are we also destined to plunge downward to stagnation or decay? Or may we, by taking thought, hope to escape the common fate of all our predecessors?"

MacDougall has examined a part of this great question from the view-point of the psychologist, and it seems to me he has struck the key-note of the situation when he says the answer lies in whether we have the ability to apply our knowledge.

The successive rise, decline, and fall of nations has provoked many hypotheses as to the cause. Some have ascribed these effects solely to economic causes; some to the action of overpopulation on food-supply; others have set up a wild and baseless analogy with the growth and death of organisms; still others, without an exact knowledge of the laws of heredity, have proposed a theory in which vigor and variability in cross-bred races gives way to decline and decays through inbreeding, this last a particularly vicious theory because of its content of misapplied half-truth.

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[1] MacDougall, Wm., *op. cit.*

Our situation, however, is wholly different from the older nations that have waxed and waned. If, in the past, civilizations have been swamped by the discovery of new sources of wealth or the opening up of new regions, we have little to fear. No warring hordes can rise up out of the mist and smite us down. We have a great knowledge of the earth and its resources. We have a wide knowledge of man himself, his physical needs, his mental capacities, his heredity and its control. We therefore hold our future evolution in our own hands. Whatever ghosts we have to fear are the ghosts we raise in our own midst. Peaceful penetration of subtle causes of decay may work more havoc than Attila and his Huns. The pressure of population on the food-supply within our boundaries may have a worse effect than when it sent our forefathers out from the North Sea borders to prey upon their neighbors. The birth-rate differential in favor of those of low capacity or of no capacity may be as a millstone hanged upon our neck.

Yes! We have the knowledge to control our fate. Can we apply it? One may well be somewhat dubious on the matter. We are fain to look back with conscious pride on the sturdy pioneers who opened up the wilderness and gave us this country for a heritage. Are we to-day their equals *as a whole?* There is some uncertainty, but the evidence points toward a negative answer. More than one statistical inquiry has been made into the ancestry of the men of to-day who are accomplishing things of value in the several lines of human endeavor. Overwhelmingly they are the descendants of these same sturdy pioneers, and not of the newcomers from eastern Europe. Is this the result of heredity, of racial endowment? Or is it merely a matter of greater opportunity? It is not easy to decide the rôle played by chance. But it is too great a strain on credulity to ask us to ascribe any high proportion of this result to chance when it is found that the members of one of the races standing relatively high in achievement, the Jews, have had less opportunities than most of the others. It is unfair to the memories of the men of power and valor, whose lives were open, whose histories one may trace, if their deeds are scored to a handicap in life's race, when records show they often won their places in spite of severe disadvantages.

If this be true, the nation as a whole is even now on the downward grade. The intelligence tests[1] for that selected group of young men, our army recruits, show that 75 per cent did not have sufficient innate mentality to finish a high-school course with credit. With due allowance for rejected inferiors who did not have the chance to come up for these examinations, one is forced to conclude that less than 20 per cent of our total population is capable of understanding these facts upon the possession of which we have so prided ourselves, upon the application of which the destiny of the nation depends.

Think of this matter! And remember that we live in a democracy!

[1] Yerkes, R. M., ed., "Psychological Examining in the United States Army," *Mem. Nat. Acad. Sci.*, vol. 15, 1921.

CHAPTER III

RETROSPECTS AND CRITICISMS ON THE GROWTH OF PEOPLES

The problem of population is not new. Like all general questions capable of being treated more or less abstractly, it has now and then interested a thinker ever since there has been some modicum of civilization. Plato and Aristotle, for example, untrammelled by the ethical considerations we should regard as necessary prerequisites to suggestions for social reform, advocated the same crude and drastic measures for limiting the population and improving its quality that the present-day animal breeder puts in practice. Theirs was a militant social surgery. Others, seeing the growth of political power and dominion in mere numbers, advised increase in population as rapidly as possible. As early as the year 10 A. D. the *Lex Papia et Poppœa* was enacted through the efforts of two old bachelor consuls, for the express purpose of increasing marriage and legitimate fecundity in Rome. Thus neither expansionists nor restrictionists of the present day are at all novel either in their ideas or their methods of propaganda.

Strangeland[1] has carefully brought together these early doctrines of population; but they are interesting chiefly as records of fallacious logic based on faulty premises. Even as the increments of nearly 20 centuries relative to the theory of evolution were comparatively flat and unprofitable until one reaches Darwin, so also the doctrines of population have little intellectual standing until the time of Malthus.

The immediate stimulus for Malthus's work was his reaction against the views of his father's idol, Rousseau, and in particular against Godwin's Anglicized interpretation of French revolutionary democracy. In his two books, *Political Justice* (1793) and *The Enquirer* (1797), Godwin maintained the thesis that political institutions alone are responsible for human misery. Social equality, opportunity at par, freedom, were the only essentials for universal happiness and well-being, according to his way of thinking.

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[1] Strangeland, C. E., *Pre-Malthusian Doctrines.* N. Y.: Columbia Press, 1904.

Whether or not Malthus himself had sufficient originality of thought to reject theories which proposed to create happiness in every household by legislation, no one knows. At any rate he had no need to be original. During the constructive period of his mental development, that is to say while still in his twenties, he came upon four works that were a unit in pointing out the influence of natural biological causes in producing poverty and distress. The essays of Franklin (1751), Hume (1752), Wallace (1753), and Townsend (1786) each and all played upon the idea that the common physical ills of society were provoked by the irresistible tendency of human population to increase beyond the limits of subsistence. In other words inexorable fate in the guise of natural laws rendered impotent every uplifter's plan of bringing about an earthly paradise by changing the social order.

This idea appealed to Malthus, and he busied himself with extending it. The result was *An Essay on the Principle of Population as It Affects the Future Improvement of Society*, published in 1798.

I have stressed the fact that the principle which Malthus made his own was confessedly not original, for the purpose of emphasizing why he was so much more successful than his forerunners. That extraordinary thinker Benjamin Franklin, in a tiny pamphlet under the title *Observations Concerning the Increase of Mankind and the Peopling of Countries*, expressed the main thesis in three paragraphs. The dependence of population increase or decrease on food, commerce, type of government, and conditions of labor, was forcefully and even elegantly phrased. The other writers were even more convincing because their arguments were more extended. Why, then, was their fate as the fate of those naturalists who, before the time of Darwin, espoused the cause of evolution? The reason is the same in both cases: it was the triumph of quantitative proof over rhetoric. Darwin jotted down his idea in his note-book and set out on the *Beagle* to gather information which would support or refute it. Malthus saw in the subject-matter of these earlier essays a proposition capable of statistical demonstration, and made a series of journeys to Sweden, Denmark, Norway, Russia, and Switzerland in search of facts. On the basis of these facts he wrote his treatise.

Malthus used the modern method of inductive reasoning based on tangible evidence, and as a result his work has had a profound influence on political and economic thought from his own day to the present. Naturally he was roundly abused. Bitter invective and sneering vituperation showered from pulpit, rostrum, and press. His ill-omened conclusions were no more popular with the unthinking majority then than now, and the Arthur Brisbanes of the day saw fair game for rebuttal by derision. But he also aroused thoughtful discussion in England, France, and the United States, and later gained wider fame by being the acknowledged source of Darwin's long-sought concrete cause of evolution, Natural Selection. It thus happened that Malthus's work had a rather strange fate. His ideas on the broad question of human population passed into the literature of political economy; while his central conclusion was appropriated bodily by biologists as the keystone of their greatest generalization, without their having the least thought of adopting the direct conclusions as he applied them, or of shifting the subject itself to their own science for investigation. The matter stood in this way until Galton, influenced by his cousin's[1] views, took up the study of human heredity, and advocated the social direction of human evolution under the term eugenics. The anomalous situation resulted, therefore, in the subject of population being cut up like a parcel of land and farmed out to different sciences having diverse objects in view and distinctive methods of research.

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[1] Francis Galton was first cousin to Charles Darwin.

Malthus's work went through many editions, and to gain a fair idea of what he really thought and taught after mature reflection, one ought to consult the third or later editions. I make this suggestion, however, merely as a matter of record. I realize that Malthus has joined that great army of creative thinkers of the past whom everybody talks about but nobody reads. The object of his inquiry was to examine the causes impeding the happiness of mankind, and to speculate on the probability of their removal. The chief cause of distress and misery he found in the constant tendency of man, in common with the lower animals, to increase beyond the means of subsistence. Irrational animals, he states, are powerfully impelled to increase their species freely, deterred by no doubts about providing for their offspring, and the results of this freedom are afterward repressed by want of room and nourishment. Mankind, impelled to increase by the same instinct, is somewhat checked by reason, but nevertheless the tendency is such that the increase of mankind actually does press upon the means of subsistence to such an extent that various forms of misery, or the fear of misery, are the direct result.

The ultimate check to population was thus held to be the want of food which necessarily results from the different ratios at which population and food increase. But it was expressly stated, contrary to the affirmation of his critics, that the ultimate check—pressure of food—is never the direct or immediate check, except in cases of actual famine.

The immediate check he found to consist in the operation of sundry customs and the effect of various diseases due to the scarcity of means of subsistence, and to such other independent moral and physical causes as tend to weaken and destroy mankind prematurely.

These obstacles to increase, which he maintained were constantly operating with more or less force in every society, were resolvable into the preventive and the positive. The preventive check, the "moral restraint" which he hoped to see increased, consisted simply in reducing fecundity by delaying marriage. The positive checks, whose action was to be arrested by thus reducing fecundity, were of various kinds; namely, "unwholesome occupations, severe labor, extreme poverty, undernourishment of children, great towns, excesses of all kinds, the whole train of common diseases, wars, plagues, and famine."

In the second chapter of the *Essay*, three propositions are submitted for proof:

> 1. Population is necessarily limited by the means of subsistence.
> 2. Population invariably increases where the means of subsistence increase, unless prevented by some very powerful and obvious checks.
> 3. These checks, and the checks which repress the superior power of population, and keep its effects on a level with the means of subsistence, are all resolvable into moral restraint, vice, and misery.

In the remainder of the three volumes of his work Malthus submits a very careful and considerate account of the evidence on the subject, and the more critically one reads it the higher grows his admiration of the judicial attitude with which it is recorded and the keenness with which it is analyzed. The available data on population and its increase, on agriculture, social customs, wars, and diseases in all the chief countries of the world, are sifted and weighed with a canny precision.

As Thompson[1] has brought out clearly in what is by far the most accurate and scientific discussion of Malthusianism in recent years, a careful study of Malthus's own statements reduces many of the criticisms made against his doctrine to meaningless jumbles of words, since he did not hold the views attributed to him. He saw clearly, for example, that increase of the supply of food without proper distribution to the more needy classes would give no stimulus to population; and by implication it may be supposed he realized that the improved means of transportation that actually have become so wide-spread since his time, would give certain countries the power to live beyond their own agricultural means. But this fact has no real connection with the fundamental thesis he laid down.

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[1] Thompson, W. S., *Population: A Study in Malthusianism.* N. Y.: Columbia Press, 1915.

Thompson's view of his position, with which I heartily agree, is this: "Although at any normal time there is food enough to keep alive all members of the population, yet it is only actual pressure upon subsistence (operating in certain portions of the population) or fear of pressure (which assumes manifold forms) which keeps population from multiplying more rapidly than it actually does." This gives a concrete meaning to Malthus's ideas, but it is hardly as concise as the mathematical form in which it is often stated; viz., "Population tends to increase by geometric progression, means of subsistence by arithmetic progression." The pith of this statement is in the word *tends*. Stated as above, it is easily demonstrated to be absolutely true. The only question remaining is: What sociological conclusions can be drawn? Unfortunately, this is not so easy.

An admirably written little book from the pen of Joseph Garnier,[1] a well-known French economist of the day, appeared in 1857, only 23 years after Malthus's death. On its title-page is the text: "Il dépend de l'homme que l'accroissement de la population amène le Progrès ou la Misère."

One can scarcely do better than to follow Garnier's estimate of the reception of the *Essay on Population* in the early part of the nineteenth century. The name Malthus, he says, is one of the most unpopular in the world. By force of circumstances, public opinion, ignoring the nature and the importance of his work, the justice and freedom of his spirit, his noble idea of service to humanity, considered him the leader of an aristocratic doctrine opposed to the interests of the masses, to the joys of the family hearth, to the growth of the people.

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[1] Garnier, J., *Du Principe de Population.* Paris: Garnier, 1857.

Up to the beginning of the nineteenth century leaders of all sorts, with a certain amount of pragmatic justification, had promulgated the idea of the glory of a rapidly increasing population. The great religious teachers with the exception of Christ and Buddha, namely, Moses, Confucius, Zoroaster, and Mohammed, were very positive in their doctrines. Christ made no specific admonition, but the Catholic Church early took a strong expansionist stand. Rulers, politicians, and men of state were at one with them. The reason is not hard to find. Vauban's aphorism, "By the number of their subjects is measured the grandeur of kings," expresses their point of view. Public reaction on this subject has very generally been that of Napoleon to Madame de Staël's query regarding the greatest woman of all time: "She, madame, who furnishes the most cannon-food at her country's need." Naturally, it would be something like this; where there are more people, there is more force, more power.

With the thunders of the church on one hand and the shouts of the political leaders on the other, no wonder Malthus had no cordial reception; particularly as he wrote a dry, stilted, academic style, and had no Huxley or Spencer, as did Darwin, to play John the Baptist for him. But even so, there might have been more real criticism and less vilification had not Proudhon turned the rising tide of socialism against Malthus by the scurvy journalistic trick of terming antisocialists Malthusians. It is a rather interesting comment on human affairs that this petty deception made a large proportion of socialists execrate Malthus without inquiring as to what he taught. And the inertia of the force lasted until the beginning of the twentieth century.

Presumably our interest in the facts should be greater than our interest in the gossip on this subject. Let us then leave in musty oblivion the diatribes of prelate and politician, and turn to more serious comment.

Even at the beginning of the nineteenth century, when reliable vital statistics were not available in quantity in even the most enlightened countries, it was not difficult to show the tendency of population toward geometric increase. As early as 1748, Hyles had found that the population of Rhode Island had doubled in 25 years. Other parts of the American colonies had doubled in from 15 to 20 years, and it could be demonstrated that immigration had not been a serious disturbing factor in this growth. Petty, writing somewhat later, had pretty good evidence that population could double itself in 10 years under favorable circumstances. And Euler, the eminent mathematician, actually constructed a population table based on registered births and deaths, by which he proved the power of population to double itself in less than 13 years.

Similarly it was comparatively easy to show the impossibility of a like increase in food-supply on a fixed area of land.

Thus criticisms of these two propositions have never carried much weight, though Sadler,[1] an English politician, gave much time and energy to the endeavor. Consequently, critics turned to other fields.

As the scientific study of the problem was of less interest during its early history than supposed proof of the inefficacy of the law through citing loopholes of immediate escape, the subject of emigration was much in the foreground. It is obvious that emigration is no reply to Malthus, and can be a temporary relief to overpopulation only so long as there are less heavily populated countries to which to migrate, but it is mentioned here because Malthus was able by his studies of emigration to demonstrate an interesting fact which has been fully confirmed by later work. He proved that emigration of the ordinary type—not including migrations of whole peoples—is a very ephemeral relief to the home countries of the emigrants. There is an immediate birth release. Natural increase rises, and the vacant places at Nature's table are filled.

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[1] Sadler, M. T., *The Law of Population.* London: Murray, 1830. 2 vols.

Of late years many careful studies of emigration have been made, and these studies have been of particular service in drawing attention to the fact that the struggle for existence is almost the sole inciting cause. The United States has been the greatest single reservoir to which the streams of nineteenth-century immigration have flowed with increasing volume, and in the United States it became the custom to attribute this flood to political oppression and religious persecution. Pride in our religious freedom and our democratic government led us to compare every racial group from the ends of the earth to the Puritans, the Huguenots, and the German Forty-niners. Congressmen never forgot to work into their speeches various high-sounding phrases about "*keeping the doors of this Haven of Refuge open for the downtrodden and oppressed.*" But this was nothing but cant, deception, or worse. The loadstones attracting people to this country were the wilds of fertile soil, the miles of uncut timber, the unused minerals. They came because the struggle for life in their native lands was hard and bitter, because they believed that in this land of plenty the wolves of hunger never scratched at the door.

A second path of escape from population troubles, which became a great favorite, was augmentation of production through new discoveries. Shortly after Malthus's day came a new era of industrial activity. Steam and electricity controlled and put to work made a social revolution. Machines of every description were invented. Luxuries impossible to the monarch of yesterday became the commonplace necessities of the poorest homes. Industrial development came so fast that increase of population was outdistanced. Food production rose by leaps and bounds. Easy transport made its distribution more equitable. The products of labor became so great they could scarcely be utilized, and capital increased enormously.

This flood of the good things of life not only turned popular attention away from the population difficulties of the past, it even caused staid old economists to applaud the cleverness of humanity in stealing out from under the hand of fate. Many of them actually believed the Malthusian law had been disproved. The cry was for more people in order that the natural resources of the world might be consumed with greater speed. Only they said "developed" instead of "consumed." The publicist *viewed with disdain* any suggestion of a little thought for the morrow.

If the industrial revolution had not come upon the world so suddenly, perhaps there would not have been so much of a temptation for every one to revel in a Belshazzar's feast. But this was the situation. It is not difficult, however, to point out the fallacy involved. Mechanization of industry had not the slightest effect on the food requirements of the human animal. Man eats just as much, when he can get it, as he ever did. Furthermore, mechanical invention, in the last analysis, probably did not increase agricultural production by a single grain of wheat. It may even have decreased it.

This statement sounds somewhat nonsensical without the following explanation of what is meant by "last analysis." On a given area of land, hard labor with comparatively few simple cheap uncomplicated tools gives the greatest returns, and it is not unlikely that this will always be so. Thickly populated places living within themselves, depending on their own land for sustenance, were not benefited agriculturally by progress in mechanics, therefore, except as such progress permitted farmers to devote a larger proportion of their time to purely agricultural pursuits. Benefits resulted because there were large tracts of untilled land to be brought into cultivation by mechanical power. Advantage accrued because steam-shovels, power-ploughs, improved harrows, and modern reapers and binders enabled a man to quadruple the units of land he could keep in tilth, though his return per unit decreased. And new methods of storage and cheap means of transportation permitted the world at large to profit. It cannot be too strongly urged that the age of steel affected the population question solely because the world as a whole was still undermanned, because there still existed large tracts of unbroken wilderness.

Certain economists have shown a startling naïveté on this phase of the subject. M. Levasseur,[1] for example, loses himself completely in a maze of words. He makes a statistical study to show how the growth of riches has recently exceeded the growth of population, and seems to feel that this can continue for all time. He asks whether we know enough regarding the future to predict a limit to industrial expansion, and says:

> We will content ourselves with saying that the known facts do not justify such apprehensions. Man did not know, or recognized but dimly, a hundred years ago the use of the forces and materials of nature which have so greatly enriched him. Does he know to-day all those which nature has hidden in her bosom? Electricity has only entered upon the scene; aluminum, of which the earth contains an immeasurable quantity, only awaits a less-costly process of manufacture to become a useful metal of the first order; the tide, the force of which is renewed every day and is inexhaustible, is ready to furnish power when coal becomes rare; the past and present seem to bear guarantees for the future; humanity need not arrest itself upon the way of progress by thinking that this road, of which it cannot perceive the end, cannot prolong itself into infinity.

All of this is incontestable. Its only fault is that it has nothing to do with the subject in hand. How a writer could think it did after filling a chapter with data proving that *food* consumption increased faster than production in certain countries of Europe during the second half of the nineteenth century is beyond comprehension. His own facts prove clearly enough that modern science provided for rapid increase of population only because of the power it gave for increased tillage of new land. The prerequisite for further expansion, therefore, is new land; and new land is limited, decidedly limited.

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[1] Levasseur, E., *La Population Française.* Paris: Rousseau, 1889–1892. 3 vols.

This statement must be qualified by admitting the possibility of an agricultural revolution similar to the nineteenth-century industrial revolution that would raise production per unit area in a degree hitherto beyond our experience. I shall discuss this question at some length later. At present I shall ask the reader to accept the unsupported statement that it is highly improbable. Various writers have indeed scouted the idea of diminishing returns in agriculture, and have gone to great length in enumerating the various factors at work to increase production. Unfortunately, it is quite evident none of them have a first-hand knowledge of agriculture from the optimistic way in which they exaggerate matters.

Probably the most severe critic of the Malthusian position among serious writers of the present day is Nitti,[1] the eminent Italian sociologist. As Thompson has clearly shown, Nitti is not consistent. What he has to say in one place is contradicted by his remarks in another. His thesis seems to be that the growth of population is dependent upon social conditions rather than upon food-supply. He notes, however, that people have passed through four stages of civilization—the barbarous, the pastoral, the agricultural, and the commercial—and believes that automatic excess of population in these periods has been the cause of progress because peoples had to advance or decay. This remark appears to be sufficiently Malthusian; but Nitti soon forgets himself and exclaims in accepted political fashion: "Malthus's law explains nothing, just as it comprehends nothing."

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[1] Nitti, Fr. S., *Population and the Social System.* Tr. London, 1884. The work of Nitti is a very sorry production indeed. He has read a great deal, but he shows no competence as a critic either in biology, economics, statistics, or logic. In no part of his book does he treat Malthus on the basis of fact. He is blindly socialistic; and, having decided in his mind that the Malthusian theory is a political doctrine in favor of capitalism rather than a biological or economic theorem, he forthwith rants against it.

Nitti enumerates a large number of social factors which he feels to be all-important influences in the situation. In this attitude he is at one with a goodly proportion of sociological students, particularly those who are socialistically inclined. They feel that all problems of society are to be solved by a reform in political customs which will systematize production in such a scientific manner that there will be neither excess nor deficiency in particular commodities, which will keep every individual at work efficiently for the short daily period necessary to provide for all needs, and which will provide equitable distribution of the products of labor.

The same reply can be made to them as to M. Levasseur, the representative of the proponents of industrial expansion as a population cure-all. Their answer does not touch the heart of the matter. Efficient labor, less waste, and better distribution will indeed provide for a greater population under any given standard of living. But provision for any particular number of people has no bearing on the population problem. Where more food is provided, more people will appear to consume it.

The socialistic writers have no case on the population question, as they have expressed themselves. Nevertheless, one has a degree of sympathy with their position, though for a reason of which they are unaware, and a reason which they would repudiate because it affects one of their fundamental tenets.

Malthus undertook his work with the idea of finding out the cause of human misery. This cause he believed to be the tendency of mankind to increase faster than the means of subsistence. He saw in preventive checks to population a general remedy for human ills. He was only partly right. Restriction of population is not a sovereign remedy for misery, any more than is increased production or better distribution. The facts of heredity show us that a fraction of the population will always remain submerged under any social system for the simple reason that these people are endowed by Nature with so little innate intellectual capacity they cannot take care of themselves competently to-day or adequately provide for their needs to-morrow.

We realize this in the case of the feeble-minded and insane, but we have not yet come to appreciate to what a large proportion of mankind beyond the limits of present-day institutional care it applies. Roughly, there was about 20 per cent of this type among the recruits tested for the American army. Presumably this implies at least 25 per cent in the general population. Though their minds are certainly rather feeble, probably not half of these people could properly be classed in the technical group known as the high-grade feeble-minded, the *morons*. They are just the stupid of the country, those who can be taught to carry out simple tasks under constant leadership and control, but who cannot advance beyond these limits under the most competent tutelage. They are those who bid fair to fulfil the prophetic words: "The poor always ye have with you." It is doubtful whether they can ever be eliminated by any practicable eugenic system, as will be shown later. Perhaps their proportionate numbers may be reduced—'tis a consummation devoutly to be wished—but to-day they are increasing.

This is the burden of civilization, which, it seems to me, has not been recognized fairly and faced squarely. A leader in a theological seminary, who with fatuous self-complacency thought he was giving a *coup de grâce* to the whole Malthusian doctrine, once said to me: "Do you really suppose there will ever come a time when any human being can fail to gain sustenance for himself by his own labor?" A trip through our benevolent institutions would furnish the answer without further argument; but ignorance is such bliss.

I shall not trespass on the patience of the reader by giving a long series of the early comments on the population question, particularly as serious treatment of the majority would be an insult to his good sense. It seems sufficient to say that the law of population enunciated by Malthus, shorn of its unnecessary subsidiary propositions, is considered incontestable by nearly all the eminent economists who have expressed themselves, and by all the biologists who have looked into it carefully. Among the earlier supporters were M'Culloch and the two Mills in England, Möser and Rau in Germany, Rossi in France, and Ferrara in Italy. More recently Ely, Ross, Marshall, Carver, Taussig, and Gide are among the eminent names to be added. This is not to say that they all agree with every word of Malthus. Far from it. They differ from him as to the quantitative effect exerted by positive checks on population, as well as to the proportionate influence exerted by individual factors. Nor would they support his idea that a preventive check to population is a panacea for the alleviation of social ills. The central thesis alone, the mathematical law, is regarded as established. Only if it could be shown that there is a progressive natural decrease in human fecundity would Malthus's law pass into the waste-basket for discarded theories; and there is no evidence whatever in favor of this negation.

Unfortunately, not all of us are conversant with the data of economics, and, even if we were, we should not agree as to their significance. As a matter of fact they cannot be interpreted alone. Only when they are considered as part and parcel of the general biology of the human race do they show the true relation between phenomena. In the following chapters, therefore, I shall endeavor to present a picture of the present world situation as regards the population and its food-supply, and to submit a forecast of the probable tendency in the future.

I find that there are three wide-spread misconceptions on the subject beyond the mere rhetoric of the "booster" who believes himself to be constructively working for world peace of mind by shouting for rapid exploitation, the type who writes the huge bill-board slogan at the entrance to every small town "100,000 by 1925." In the army he who carries on without arms, without supplies, without hospital facilities, without any foresight whatsoever, is court-martialled; in civil life we call him an "optimist," and elect him mayor.

The first fallacy one might term the Valor of Ignorance. The gentleman from Missouri is ready to admit past and present population pressure in limited areas. He grants there will come a time when the earth will be packed as full of human beings as is compatible with comfort. He concedes that there will come a population problem. But he says: "How does this concern me?" He gets out a pencil, and by the sole aid of the multiplication table houses half a billion people in Texas, quarters a billion or so on the tops of the Rockies, and builds ocean-going house-boats for those he cannot accommodate elsewhere. "This is a matter for somewhere around 5000 A. D.," he jocosely remarks; "come around then and I'll talk to you."

Fortunately, this is the easiest type with which to deal. Acquaintance with present-day rate of population increase and with the visible sources of food, that is to say with vital statistics and with agricultural economics, shows it to be distinctly a question of the day. The world supply of arable land is being taken up with an even greater rapidity than that which caused the disappearance of the public domain of the United States within a single century. That the present rate of natural increase kept up during the complete lifetime of our children will give a world saturation point at the present efficiency level is as easy to demonstrate to the unbiassed mind as that two plus two are four. Of course it is admitted that saturation points differ with the temperature, and that science is a remarkable storehouse of energy wherewith to raise our efficiency; but if one keeps to the same metaphor, he should not forget that the earth is like a closed vessel, and with the rise in temperature comes a rise in pressure. It is this pressure in which we are interested. In the past, we had pressure only at certain points and the possibility of some relief through migration; now we are facing a new situation, world saturation.

The second error arises through a more subtle misapprehension. It is sponsored by those superior persons who excuse apathy by saying it proves their faith in the human race. "The human animal has a pretty good top piece," they say, "and when real problems arise the solutions will come." Of course they will, after a fashion. No one denies it. But, after all, what is the use of having a brain if it is never used except to meet the immediate situation? To deal with a situation clearly seen and prepared for in advance is often easier and usually better than to deal with it by the makeshifts born of necessity. This fact is generally admitted and acted upon in the ordinary walks of life, but a proposal to treat social problems in the same manner is too new a conception to be readily accepted. Perhaps we like to "muddle through." It is indeed a sporting proposition.

The specific argument of such a care-free optimist is this: Admitting for the sake of being agreeable that the world is approaching a saturation point in terms of present-day efficiency, he believes we may live as prodigally as we wish because there will be new systems of agriculture, better plants, finer domestic animals, novel sources of energy, synthetic foods. Pointing to the change in human efficiency made by the passage from barbarism to grazing, from grazing to agriculture, and from agriculture to the age of steel, he says: "Would you dare predict that these successive turns for the better will end?"

With the concrete suggestions given above, I shall deal later. Here I wish to speak only of the question as to whether he who proposes to peer into the long to-morrow should always be consigned to the depths of Dante's hell where punishment is prepared for those who make evil predictions. My point is that this attitude is indefensible. It is itself a relic of mysticism. As a matter of fact, the prophet of to-day is honored in every country. He does not pass under the name of prophet, it is true; but his work is divination, none the less, divination by past events which cast their shadows before. Our actions are to a large extent dictated by carefully drawn conclusions based on past experience. In physics, chemistry, biology, economics, current practice is simply tacit consent that causes producing certain effects in past time will again produce the same effects in future time. Even where the individual factors cannot be ticketed and named, as in the case of life insurance, it is still possible to make predictions which come to pass, on the average, with remarkable consistency. Why then should there be any hesitation in accepting what science can tell us as to the probable resources of to-morrow? The objection is that one cannot tell whether the causes obtaining in the past will remain effective in the future. This is true; but one can make a fairly accurate estimate of the general trend of these causes, and be thus guided to proximate conclusions well worth while. It is far better than trusting to chance. We know this to be true in the case of individuals, but are shy at accepting it for a world policy, especially when it touches a fundamental instinct like reproduction.

The third error is that of distrust. With it one has more sympathy. Not for that dismal idea, so often expressed, that the human race is not worth saving from its follies, even if it be possible, but for the practical distrust of our ability to give proper direction to human evolution. If any part of this distrust is born of a desire for knowledge of what effect population changes will have on international good-will and national prosperity, it is a good sign. We do not know with any great exactitude what is the resultant difference between a *laissez-faire* policy and a directive policy. But since we are actively busying ourselves in thwarting nature in the case of private health, we ought at least to gather together what data we have and see what conclusions can be drawn in the case of public health.

I believe it can be shown that a restricted population makes for the better along every line, the international, the national, the family, the individual. But it is not the part of wisdom to deny the practical difficulties involved in achieving restriction, or to assume with Malthus that it will do away with all distress and misery.

CHAPTER IV

THE WORLD SITUATION IN POPULATION, AND THE FOOD-SUPPLY

Astronomers tell us the earth is continually growing larger from the meteoric gifts of the great outside; but in another sense, a kind of an Einsteinian sense, it is only about one-twentieth as big as it used to be. Forty-knot vessels, 60-mile trains, aeroplanes, wireless, and other devourers of distance, have made neighbors of us all, whether we wish to be neighborly or not.

A century ago a trip from Boston to New York was an affair of some moment, a journey to Washington was a true nomad's pilgrimage, an expedition to the Pacific coast meant farewell for a year, or maybe two. What are they now? A few hours' run, a comfortable night's sleep, a week in a Pullman palace.

It is difficult to realize the entire change in our outlook on economic problems due to these easy means of globe-girdling. In the olden days a people raised its own food, manufactured its own utensils—or went without. To-day one sits down to breakfast, spreads out a napkin of Irish linen, opens the meal with a banana from Central America, follows with cereal of Minnesota wheat sweetened with the product of Cuban cane, and ends with a Montana lamb chop and a cup of Brazilian coffee. Our daily life is a trip around the world, yet the wonder of it gives us not a single thrill. It is so familiar, we are not even contemptuous; we are oblivious.

And even as the commercial aspect of the population problem has wholly changed, in like manner personal migration has entered on a new phase. Earlier, whole tribes, sometimes forced out of their native plains by overcrowding, sometimes for mere love of adventure, girded their loins and fared westward till they found a fertile land to their liking, and took it, in spite of all protests on the part of the previous owners. To-day migration is by the single family. They go to and fro upon the earth with little hindrance seeking places to better their personal fortunes. There is no thought either by their new neighbors or by themselves as to what will be the ultimate result of such change of residence.

More migration has taken place during the nineteenth century than in any half-dozen centuries in the history of the world. Peaceful penetration has been glorified. There has been no blare of trumpets or flying banners, but people by the millions have flitted out of their native harbors to the uttermost parts of the earth. They have settled these uttermost parts, and have increased and multiplied at a greater rate than before the flitting. And why has this been so? With cheap transportation effecting such a thorough distribution of the earth's products that some of our economists believe pressure upon subsistence need no longer be feared, why have these myriads torn themselves away from their native heaths and fled to foreign lands? Largely because these conclusions were not justified. Modern commerce did make a great change in the world situation. Various congested districts were no longer congested because the products of the mechanic arts could be exchanged for food brought from recently opened lands. In every commercial country Nature's banquet-table was thus enlarged. But the secondary result of this same cause was an increase in the birth-rate, and the newly created seats were soon filled with hungry occupants.

How fast the population of the earth increased in the past is an unknown quantity, and will remain unknown; but it is not difficult to prove that Malthus was right in his conjecture that an advance in civilization simply presses the barriers to existence a little farther from the tidal flood pressing against them. The barriers are neither thrown down nor overcome. No, not for an instant. As the barbarous state gave way to the pastoral, the pastoral to the agricultural, and the agricultural to the industrial, there was more and more room for man; but men came to fill that room as fast as it was opened to them. In past stages there was pressure, to-day there is pressure, the future will still show pressure—if Nature takes her course.

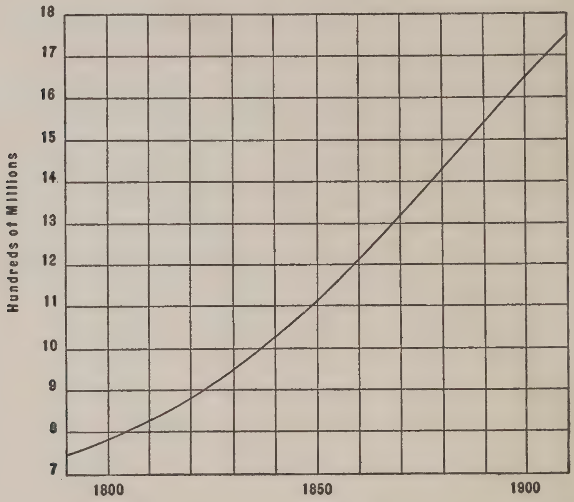

Fig. 1. PROBABLE WORLD INCREASE IN POPULATION DURING THE NINETEENTH CENTURY.

To-day we are going at full speed ahead. The human race has had a long pull of half a million years since it first rose up on its hind legs and made a bid for world supremacy; it has had a history of at least 10,000 years since it developed enough mentality to leave written records; yet in all this time its natural increase was so slow that in the year 1800 there were less than 850 million people. Since that time, a short 100 years, the population has more than doubled. Half a million years, let us say, to reach a population of 850 millions. Half a million and 100 years to reach a population of more than 1,700 millions. This is some justification for saying the present age is an age of speed.

Mankind has had an average annual increase during the past century of about 0.7 per cent, and the increase at present is as great as at any time during the past. My own estimate of this current material increase, from a careful study of all available data, is about 12 millions. In other words, there are almost two new Belgiums to feed just now with each additional year, and the number is increasing like a compound-interest table. And my own estimate is conservative, since Knibbs,[1] one of the most eminent of our contemporary population statisticians, estimates the current increase at 1.16 per cent, or nearly 20 millions a year. By his calculation the world must provide for a new France at every biennium.

What do these huge figures mean in terms of food and land? Pitkin[2] has recently calculated them in his carefully written book *Must We Fight Japan?*, which because of its seemingly jingoistic title has not had the serious consideration it deserves. Arguing from the army rations of the civilized world, he shows that the average adult requires a thousand pounds of dry foodstuffs per year. Allowing for natural loss and provision for seed, then, every year the farmer must provide the world with some 23,000 million pounds of foodstuffs more than they ever provided before if the people are to be fed. Translating these figures into land requirements is still more staggering. On the average it takes from two to three acres to support a man. Thus every season the tillers of the soil must prepare, plant, cultivate, and harvest nearly 40 million acres more than they did the year before unless they can persuade mother earth to give up more of her bounties than has been her habit of yore. And, with few exceptions, every new plot of virgin soil subdued is just a little worse than that which went before.

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[1] Knibbs, G. H., "The Mathematical Theory of Population," etc. *Census Commonwealth Australia,* Appendix A, vol. 1. Melbourne: McCarron Bird, 1917.

[2] Pitkin, W. B., *Must We Fight Japan?* N. Y.: Century, 1921.

It is easy to see that a rate of natural increase such as this could not possibly have been in force during earlier periods of the world's history, unless it be assumed that periodic catastrophes far beyond anything of which there is record have practically wiped out the human race. It takes merely the evaluation of a problem of compound interest[1] to show that a single pair of human beings would have produced the present world population in less than 1800 years. Even the low rate of increase in France (.0016) just before the war, when France was being held up to scorn by ill-informed publicists as a decadent nation, would take our hypothetical Adam and Eve back to only 10,000 years before Christ.

The current rate of growth, according to Knibbs, doubles the population every 60 years. If it were possible to maintain it, therefore, our great-grandchildren would live to see some 7,000 millions struggling for life, while in the year 3000 A. D. there would be the stupendous number of 34,000 million souls. Thus, says Knibbs, it is certain that however great human genius or effort may be in enlarging the world's food-supplies, this rate cannot be maintained for many centuries.

There are various methods by which to confirm this conclusion. A production calculation is perhaps as convincing as any. Excluding the arctics, the land area of the world is 33,000 million acres. The International Institute of Agriculture at Rome[2] has determined the proportion of cultivated land to total area in the most populous countries, which are generally the countries with the greatest relative amount. On the average it is about 40 per cent. If a similar proportion of the land area of the entire globe is assumed to be the maximum limit for arable land, there are 13,000 million acres available for food production.

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[1] If P is the given population, the population at the end of any given year n is $P(1 - r)^n$, where r is the rate of increase.

[2] The agricultural statistics found here and on succeeding pages are based on figures from either the publications of the International Institute of Agriculture, *The Statesman's Yearbook,* or the United States Department of Agriculture.

The number of people this huge world farm can support will vary with the progress of the art of agriculture, with the provision for transportation and for storage, with the security of property, with the efficiency of human effort, with the type and the amount of food consumed per capita, and with the margin of safety necessary to tide over the years when the crops are poor.

I have made a rather extended study of this matter, based on the assumption that there will be sane beneficent governments, adequate means of distribution, constant efficient effort equal to that of western Europe during periods of peace, agricultural production equivalent to a return per acre midway between the average and the best in the world to-day, and a standard of living on a parity with what is found in the more densely populated countries of Europe. This study has led to the conclusion that a reasonable maximum for the world's future population is one person for each 2.5 acres on 40 per cent of the land area of the globe. This gives a figure of 5,200 millions, a population which at the present rate of increase would be reached in just a little over a century.

Let us emphasize this result. Under the most optimistic assumptions as to production and distribution of food that it is reasonable to make, the world can support but 5,200 millions of people; and these people must content themselves with the limited dietary and the few material necessities which form the current standards among the peasantry of Europe. Furthermore, if the present rate of increase could continue unabated, babies now alive would live to see this event come to pass. The world would be filled with people without faith or hope, a seething mass of discontented humanity struggling for mere existence, within the span of a single lifetime.

It would not be particularly interesting to follow out the method of making these calculations in all of their details, but it is not difficult to show that they are based on quantitative evidence. By the returns of the International Institute just before the war, Germany was tilling 1.15 acres, France 1.5 acres, Italy .98 acres, and Belgium .57 acres per capita. The fact is, however, that these countries are not self-supporting. Huge quantities of food are imported annually. Even Germany under the pressure of war could not live within herself. She eked out an abnormal existence for four years by confiscation from Rumania and Serbia, and by importing fats and concentrates through various underground routes. It is difficult, even on the basis of pre-war figures, to find out with absolute accuracy just what proportion of their people these countries then supported; but from the most trustworthy data obtainable the maximum figures are: Germany, 72 per cent; France, 70 per cent; Italy, 64 per cent; and Belgium, 37 per cent. After making certain slight corrections due to non-comparable data having been reported and for forest products cultivated, therefore, it follows that Germany really cultivated about 2.0 acres for each man supported by her own agriculture, France 2.3 acres, Italy 2.4 acres, and Belgium 1.7 acres. This gives a weighted average production for these countries of 2.2 acres per capita, an amount which taken by itself is not very far from the figure of 2.5 acres per capita estimated as the maximum possibility for the world as a whole. But the cheerful optimism of the estimate is not fully realized unless one is familiar with the agriculture of western Europe. Belgian production per unit area is 121 per cent more, German production 69 per cent more, and French production 23 per cent more, than the average for that part of the world for which statistics have been compiled—naturally the more efficient countries. Parenthetically it may be remarked that agricultural efficiency in Italy is just below the average, and the result is that her people are neither so well fed, so well clothed, nor so well housed, as those in the other three countries. If, therefore, those countries of western Europe which have an agricultural efficiency averaging 70 per cent greater than the average for all advanced countries and probably over 100 per cent greater than the mean for all countries utilize 2.2 acres to provide food for each person, it would seem that 2.5 acres per capita as a future world average is as high a figure as one could reasonably set.

These calculations allow the same proportion of the population of the future to be supported by sea food as is supported at present, and it is a grave question whether more than this is possible. It is easy to see a food source of limitless extent in the tremendous water area of the globe—an area four times that of the land. But one feels constrained to discount too great an optimism when he looks into the facts. Plants are as much the primary foods of the sea as of the land, and scarcely any of the important species can be used directly. There is a carnivorous succession through several mouths before they come to our tables as mackerel or salmon, with much waste in the process. Most of these plants are probably found in the shallow waters less than 200 feet in depth, for light is essential in their elaboration. It has been estimated that the plant growth in such situations is about equal to primary food production on land, and the depth maps of the sea show that this area is roughly equal to 5 per cent of the land area of the globe. Does it seem likely, moreover, that over one-tenth of 1 per cent of the tissue of these plants can ever be available in transmuted form for human consumption? On such assumptions the food resources of the sea are negligible when compared with those of the land.

Of course certain students of the subject feel that some of the small forms of life such as the diatoms and the peridines which are more widely distributed multiply these possibilities several times over. But I have talked with several persons who have spent much time in surface trolling on the high seas, who have reached the conclusion that the deep-sea waters contain very little primary food. And Petersen,[1] the most eminent of those who have investigated the plant resources of the sea, concludes that the plankton, as these floating organisms are called, forms a negligible part of the food of the molluscs, fishes, and mammals suitable for human consumption. He finds that the primary food of fishes, in northern waters at least, is largely eel-grass. The truth is, therefore, that proper data do not exist by which to estimate accurately the stock in old Father Neptune's larder. We must rely on the estimates made by the economists.

The statistical returns are inadequate, it is true, but making all due allowance for understatement, the sea-food industry of the world is less important than that of the production of poultry and eggs in the United States. Just what increase in these returns can be made in the future is problematical, but it is hardly likely that an *increased proportion* of the population can be supported by the sea, for diminishing returns are indicated in this industry by the fact that the increase in the capital employed during the last 20 years is relatively greater than the increase in the yield of product.

The most sanguine of our population enthusiasts will criticise the above figures, no doubt. They will point at once to Japan as the shining example of efficient agriculture, an example that we ought to hold ever before us and strive to emulate. Japan, with a population of 56 millions in 1920, cultivated a little over 18 million acres out of a total land area of 94 million acres. By an extraordinary use of fertilizers which amounted to about 4.5 tons per acre over the whole cultivated area, exclusive of commercial chemicals, she thus *appeared* to be able to support three persons per acre. Using these figures as a basis, several prominent editors have computed that the State of Texas or of Arizona —deserts mean nothing in their conception of agriculture— could support the entire population of the world.

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[1] See Martin, G. W., "The Food Resources of the Sea," *Scientific Monthly* 15 : 455–467, 1922.

But appearances here are deceitful. The first delusion is to suppose that Japan supports 56 million people by her own agriculture. She does no such thing. She supports not over 40 million people, and buys imported food for the rest with the products of her factories.

The second error is due to the fallacy of assuming that because Japan feeds 40 million people on 18.7 per cent of her land area, she could feed 80 million or more people on the 40 per cent of her land presumed to be tillable. As a matter of fact, it is doubtful whether Japan could feed a single additional person by this means except by raising her agricultural efficiency per unit area. Japan cultivates a comparatively small proportion of her land by a method built up under stern necessity in China, because it has been found that this method gives the greatest returns. She even goes so far in her conservation and utilization of soil fertility as to strip the surface soil from spots in the less-productive areas for use on the better land. She does this because it pays, not because her farmers are too lazy to plough more soil. From a study of King's[1] first-hand investigations of the agriculture of China and Japan, and from conversations with various Japanese agricultural students, I am convinced that Japan will produce very little more food than she does at present if she endeavors to raise her acreage, because the remaining land is so poor in quality and because she will not be able to command a greater total amount of fertilizers than she does at present. Thus, if we change our estimate of Japan's productive ability to a form which makes it comparable with the suggestion that probably 40 per cent of the world's land area will ultimately be used for agricultural purposes, it turns out that she is supporting 40 million people on 40 million acres, or one man per acre.

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[1] King, F. H., *Farmers of Forty Centuries.* Madison, Priv. printed, 1911.

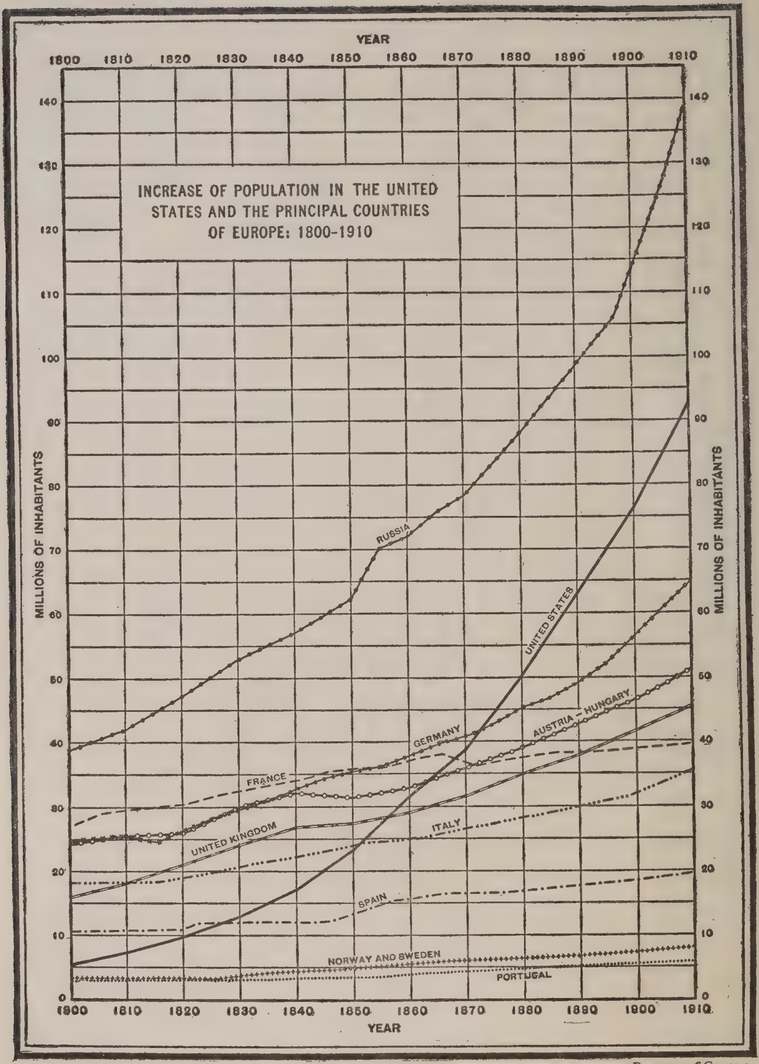
Third, Americans are inclined to draw erroneous conclusions when comparing the agriculture of Japan with that in their own country, because they fail to take into consideration the difference in food intake per capita. Our own estimates have been based upon a properly varied diet at the commonly accepted adult rate of 3,500 calories per day. This is not only a reasonable requirement for the people of the world as a whole, it is a necessity for the great majority; but the Japanese appear to get along more or less contentedly on a much smaller amount, because they are a small people. Their army rations are only about half of our own, hence it seems fair to conclude that the average consumption over the whole country is in the same proportion. *If this be true, the correct conclusion to be drawn is that Japan is capable of supporting only one person for each two acres over* 40 *per cent of her land area at an American dietary standard.*

The term "American dietary standard" means only a cheap balanced ration of 3,500 calories per day consisting largely of vegetable products. The steaks, roasts, and chops, so dear to American hearts, are not included. If the Japanese were to be fed the same number of calories per capita as the American people, and the ration were to be made up with a like proportion of meat, their acreage per man would mount still higher. A method determining this rather precisely exists, which at the same time gives us a check over our former figures. In 1920 the United States cultivated 503 million acres, which is at the rate of 4.8 acres per capita if exportation is neglected. For many years before this the yields of all the important agricultural crops of both Japan and the United States are known, making it possible to compare directly their agricultural efficiency. The formula for making the computation is given later; it is sufficient here to say that crop production in Japan exceeds that in the United States per unit area by about 50 per cent instead of 500 per cent, as expansion propagandists would have us believe. Thus if the Japanese ate as much of the same kind of food as Americans—and wasted as much—they could support only one man on each 3.2 acres out of their 40 million presumptively arable acres, or less than 13 million people in all.

From these data it is clear that the calculation of 5,200 million people as a world saturation point is ultraconservative. And the fact that the present rate of natural increase would give this number in less than a century makes good the claim that the population problem is one demanding immediate attention.

Naturally, the present rate of increase in the world cannot be maintained. The pressure of digging out a living where the digging is hard will cut down the birth-rate and increase the death-rate, even if preventive checks to population do not become more active. I am only holding a stop-watch on the pace the world is going at present. The population is rising at the most rapid rate in history. Soil fertility is being exploited with high speed and unnecessary wastefulness. Call is made for less hours of productive labor and for more of the good things of life. Thus, the two great opposing forces, to which attention was called earlier, are seen to be increasingly in evidence. There are the natural human desires to live an individual life of comfort and to exercise the instinct of reproduction without care or forethought: there is the immutable law of diminishing returns, which rules in agriculture more strictly than in other industries, pulling down and simplifying the standards of living, and requiring greater and greater efforts for mere existence as time goes on.

What has just been said regarding the world's population stands as a proof in itself of the correctness of the essential



Bureau of Census.

FIG. 2.

parts of Malthus's law of population. But we did not set out merely to record gross statistics of this type. We wish to analyze the situation in detail as best we may, in order to show just how the problem confronts us to-day in various parts of the world.

We know little about the exact growth of any of the world's peoples until the beginning of the nineteenth century, though an estimate by Levasseur,[1] usually accepted as the best available, places the population of Europe at about 90 millions at the beginning of the eighteenth century, and at twice that figure a century later.

In 1916 calculations made from the census statistics collected by the registrar-general of England, show that the population of Europe was in round numbers 465 millions. In addition Europe had sent forth emigrants in an endless stream to the Americas, to Australia, and to Africa, whose descendants numbered 185 millions. People of European stocks therefore totalled about 650 millions at that time. Thus they had more than trebled in numbers in a little over a century.

The growth of some of the individual nations concerned, and, in addition, that of the United States, is shown graphically in the accompanying figure. The numbers on which these curves are based are census returns or official estimates of the actual population of the countries at the dates given, taking no account of emigration or immigration; thus they do not show the natural increase due to excess of births over deaths. It is therefore only an approximate way of presenting growth of population. But by considering the nations together in one's mind, a fair idea of general increase can be obtained.

The rapidity with which certain of these countries were increasing in numbers between 1906 and 1911 has been estimated by Knibbs[2] as follows:

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[1] Levasseur, É., *La Population Française.* Paris: Rousseau, 1889–1892. 3 vols.

[2] Knibbs, G. H., *op. cit.*

Country	Rate per 1,000	Years to double
France	1.6	436
Norway	6.6	105
Sweden	8.4	83
Austria-Hungary	8.5	82
Spain	8.7	80
England	10.4	67
Japan	10.8	64
Holland	12.2	57
Germany	13.6	51
Rumania	14.8	47
United States	18.2	38
Australia	20.3	34
Canada	29.8	24

France is the slowest-growing country, doubling in population in 436 years; while Canada is growing most rapidly, doubling in population every 24 years by an annual increase of 29.8 per thousand.

These figures, however, do not mean a great deal except when added. As a whole they show the growth tendencies of the white race, and of Japan; separately they do not give one an accurate idea of growth of the peoples concerned. For example, if one were to glance over the population figures for Ireland he would find a steady growth from slightly over 5,000,000 in 1800 to 8,000,000 in 1840, and then a steady decline, so that in 1900 the population was less than 4,500,000. By the professional Irish republican this peculiar situation is attributed to the harsh treatment of their people by the English Government. The true interpretation of the facts is wholly different. At the beginning of the nineteenth century Ireland was a grossly overpopulated agricultural country. It had few industries and no commerce, and the people struggled to maintain themselves on a relatively barren soil. But industries expanded, and with this increase came a rapid population growth which allowed an immense number of people to emigrate and still provided for an actual increment of 60 per cent in 40 years. Since that time increase in population has kept up. When the birth-rate per thousand married women of reproductive age is calculated it is found to be one of the highest in Europe. It has even mounted in the past 40 years. The rate of multiplication of the Irish people, therefore, has been very high, but it has not shown as high an increase of population in Ireland because of the constant emigration of the young people of reproductive age.

England and Scotland, on the other hand, not only have furnished immense numbers of colonists to the outlying possessions of the empire, but the countries themselves have grown in population until it is no longer possible for them to support themselves. This was what made Germany's submarine warfare of so much importance. There was a time when official calculations showed that if Germany could have kept up her current rate of sinking the vessels carrying food for England, the English people would have starved within two months.

In 1912 Sir Henry Rew made up a careful estimate of the food production of the United Kingdom, and found it to be about one-half of the requirements. During the war, when the English were going into all food questions pretty accurately, a report to the Food Committee of the Royal Society based on the returns of 1910–1914 showed the food production to be just 41 per cent of the requirements. They were able to supply themselves with vegetables, with 60 per cent of the meats, with 68 per cent of the eggs, with 36 per cent of the fruits, but with only 20 per cent of the wheat and the animal fats. These figures include those for Ireland, which may be regarded as self-supporting, so that the really fearful overpopulation of Scotland, England, and Wales stands out as a striking fact.

Sir Henry[1] testified before the English Birth-Rate Commission recently that in 1871 the farm area of the country represented 1.18 acres per capita, in 1911 only .79 acre. In 1871 the land under the plough was .71 acre per head, in 1911 it was .36 acre. The wheat acreage per capita was .14 acre in 1871, .05 acre in 1911. The cattle census represented .20 per capita in 1871, .17 per capita in 1911.

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[1] Marchant, J., ed., "Problems of Population and Parenthood," 2d Rpt., Eng. Birth-Rate Com. London: Chapman and Hall, 1920. See pages 147–161 for testimony of Sir Henry Rew.

Doubtless, efforts to increase both acreage and yield in Great Britain will be crowned with some success, but it must not be thought that the percentage increase made by the utmost of such efforts is going to be sufficient to make the island self-supporting. Perhaps an increase of production of 25 per cent may be possible. I question it, but let it pass. Indications of the utmost effort may be obtained from the war record. Of all the allied countries, only Great Britain actually pulled in her belt and cut down the food intake per capita. It was not done in her colonies, in France, or in the United States. People in these countries made dietary changes only where they had to; they did not cut down their total consumption voluntarily by a single loaf of bread. But in Great Britain things were taken seriously, and consumption was reduced. In addition, stupendous efforts were made to increase production. This had its effect. The wheat-crop of 1918 was the largest since the record crop of 1882, and filled 30 per cent instead of 20 per cent of the requirements. Luck was with the winner. The other crops of 1918 were also extraordinarily good. The weather was propitious and the losses were small. Even with these fortunate circumstances, however, the newspaper report that Great Britain was able to raise her home production from 50 per cent to 90 per cent was merely war propaganda for enemy consumption. What she really did was to raise her production from somewhat over 40 per cent to slightly over 50 per cent. Giving her the benefit of every doubt, she is able to produce less than 60 per cent of the food she needs.

The remaining countries of Europe are not all in the con-

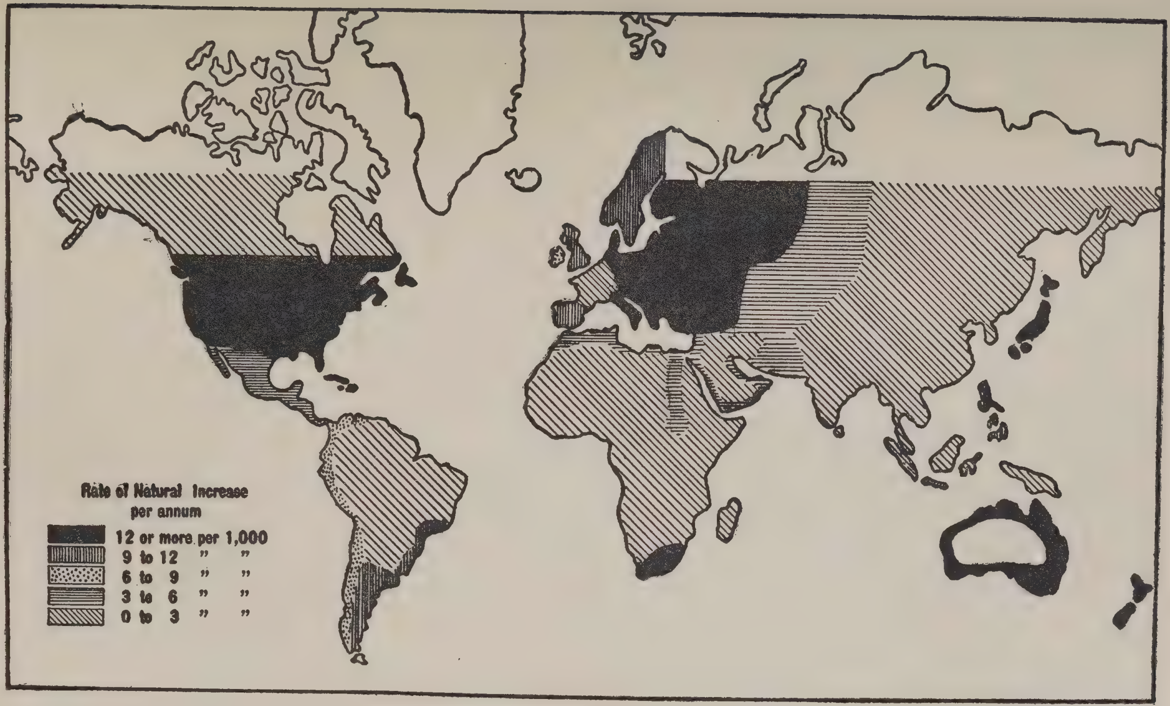
Rate of Natural Increase
per annum
12 or more per 1,000
9 to 12 " "
6 to 9 " "
3 to 6 " "
0 to 3 " "

Fig. 3. WORLD MAP SHOWING THE PRESENT RATE OF POPULATION INCREASE.

dition of Great Britain. In fact, Russia, Bulgaria, Rumania, and Servia just before the war were more nearly in the condition of the United States about 1880. They were importing farm machinery, and by utilizing it to increase the amount of land tilled per man had become food-exporting countries. This was particularly true of Russia. Russia had large quantities of land, and by her old methods had not been able to cultivate it. But by utilizing the results of industrial progress in other countries she was having a great agricultural boom. Her population was increasing rapidly in consequence. The annual excess of births over deaths varied from 16 to 18 per thousand, yet even this rapid population expansion had not kept pace with the increase in production. Although the other countries mentioned had not Russia's proportion of unused land, they also were able to increase their production by modern methods to an extent they had not dreamed of half a century before. Population was increasing marvellously, but as yet it had not been able to overtake production. In spite of such facts, there was subsistence pressure in all of these countries. They lacked cheap means of transportation and storage, and their governments were such that a large proportion of the people was struggling in the midst of plenty to make both ends meet. Nevertheless, the world was by way of seeing a continuous increase of population in these countries, and at the same time a bettering of conditions of living when the war broke out. They were just in the throes of repeating the population history of northern Europe and of the United States a generation before. Now, they are more or less prostrated owing to the political and economic conditions resulting from the great conflict. But just as soon as general conditions permit, a revival of agriculture will ensue, with a return to the general course of events of the first decade of the century. Production will keep ahead of population for a time, then gradually the countries will be filled and the struggle grow sharper. At the pre-war rate one may expect about 30 years of expansion before the slowing-up process becomes marked.

Spain, Portugal, and Switzerland have been in still another situation.

Switzerland, with 10 million acres of mountains, has cultivated rather efficiently the 3.5 per cent that seemed to be worth cultivating. She has been importing some food; but having little to exchange for food, excessive population increase on the products of other soils was denied her. Her rate of increase has been decreasing steadily, until it is now about .7 or .8 per cent. Perhaps if the proposed utilization of Swiss water-power is ever accomplished, there will be an industrial expansion which will help provide for more people.

Spain and Portugal also are countries living practically within themselves. They import some food, but they export nearly enough to balance the ledger. In both countries there is a rather primitive agriculture. Their yields per acre are not what could be obtained by a careful application of modern agronomical principles. At the same time they do cultivate about 30 per cent of the land area—which is about all there is any prospect of cultivating—by methods which compare favorably with the average for the rest of the world. In other words, these countries have almost reached their limit by their present methods of production, but could support more people—perhaps as high as 50 per cent more—by better methods of agriculture.

The remaining countries of Europe, France, Belgium, Holland, Germany, Austria-Hungary, Greece, Sweden, Denmark, and Norway are overpopulated. It will be noticed that I speak by the pre-war map. This is not because I have forgotten the war or the changes it made, but because the statistics available for study are on the pre-war basis.

With a fair degree of accuracy one can tell how nearly these countries came to supporting themselves agriculturally by comparing the total net cereal imports, excluding rice, with those of the United Kingdom for the three pre-war years 1911, 1912, and 1913. The results for the countries having reliable statistics of their commerce were as follows:

NET CEREAL IMPORTS

Country	Average net imports, bushels	Per capita, bushels
United Kingdom..........	418,963,000	9
Germany................	237,088,000	4
France..................	116,852,000	3
Belgium.................	103,790,000	14
Italy....................	84,376,000	3 −
Holland.................	76,148,000	12 +
Sweden and Norway......	36,718,000	5

Taken at their face value, these returns would seem to indicate that Belgium and Holland were less able to support themselves than Great Britain. But this is probably true only of Belgium. Holland exported some considerable amounts of other foods. The same may be said of all the countries, of course, but the relative proportion of exports to imports was large only in the case of Holland and the Scandinavian countries. They are all overpopulated when considered as units. Perhaps after excluding Great Britain the descending order should be Belgium, Holland, Italy, France, and Germany. The Scandinavian peoples could be self-supporting with their present population if the necessity arose.

Now whence comes the food which the overpopulated countries of Europe buy with their industrial products? We have already mentioned Russia and Rumania, the so-called granaries of Europe until war turned them topsy-turvy. In addition there were four great sources of supply—Australia, Canada, India, and Argentina. Let us consider their future as granaries for the world.

Australia is almost exactly the size of the United States and has about 5 million people. Only 1 per cent of her land is cultivated. Here, many have said, is a perpetual fountain of plenty. But the truth is, Australia was settled by energetic Anglo-Saxons, who, as in Canada, are repeating the history of the United States. They have used and are using their brains for extensive agriculture just as was done in our own land from 1850 to 1890. They have been able to produce such large crops per man that the population, though increasing more rapidly now than in almost any other country, has not been able yet to overtake it. At the present rate of increase they are doubling the population in 34 years. That is to say, in another century, if this increase should go on, Australia would have 40 million people. And they cannot stand this rate of increase. Therefore, Australia must be marked off the list as a source of any but temporary support for indigent peoples.

Premier Hughes is reported as forecasting a hundred million population for the Australia of the future. If there were a reasonable basis for such a statement, it would be stupid politics to advertise it to the world in face of the present turmoil in the Far East. The Japanese militarist, living in the midst of an overcrowded country, becomes positively green when it is flaunted in his face that a neighboring country capable of supporting 100 million people is held by 5 million white men. And one cannot blame him. But there is no foundation for such a boast, and agricultural experts of Australia have publicly protested against it.

These worthy people are living on the rim of a soup-plate. The rim is fertile—at least in spots—the bowl is a barren desert without water-supply. There is no hope of any very considerable irrigation projects. Out of their 1,904 million acres, there are only about 40 million acres of arable land by the most optimistic estimate. Thus Australia, when treated as a place to live, shrinks to the size of Spain or possibly Italy. It is highly probable that in less than 30 years she will cease to be a food-exporting nation.

Canada, as I have said, has developed rapidly in the past few decades. In 1914 she had only 8 million people, but her rate of increase now is comparable with that of the United States in the early part of the nineteenth century. The population is actually doubling in less than 24 years. And it is a significant fact in considering the New World outlook that of the 117,336 immigrants arriving during the fiscal year ending March 31, 1920, 49,656 of them came from the United States. The country is something of a garden-spot, and visitors are coming at a rapid pace to cull the fruits.

The 2,300 million acres of land area is larger than the States, and there is little real desert; but the available productive land can be reduced at once by 75 per cent because of the climate. On 1,500 million acres of Canada's territory it is simply too cold for real agriculture. It has additional possibilities in the way of grazing for reindeer to the northward, but the maximum potential of arable land is in the neighborhood of 150 million acres. Of this area, about 50 million acres are now improved.

If Canada can support 60 million people eventually, she will do well, and she will approach that number in less than three-quarters of a century, unless her present rate of increase diminishes. As a food wholesaler she must close up shop at about the same time as Australia.

Argentina, on the other hand, with Uruguay added as being a part of the same agricultural unit, will be exporting food for a somewhat longer period. In all likelihood the territory of these two countries will be the last great temperate expanse of arable land to become sufficiently populous to forbid food exportation without a return in kind. For this reason, a tentative date marking the time when agricultural returns will diminish is especially interesting. Of course one cannot pretend to astronomical accuracy in such a forecast, but one can measure the size of the vessel, and say how long it will take to fill it if the population flow takes a course similar to what it did in the United States.

The total land area is 775 million acres, with only 62 million acres now under cultivation. Generally speaking, the topography is good, there being a series of prairies with forest to the northward, drained by two large river systems from the Andes to the Atlantic. In the west and south, however, the same climatic difficulty exists as in the United States: the country is a semidesert because of low rainfall. The maximum acreage of true agricultural land has been set at 350 million acres, although this estimate may have to be scaled down after further experience with intensive cropping gives new insight into the problems involved. No one knows how productive the soil will be when worked to the limit; but assuming it to be of average quality, it may be possible ultimately to house 140 million people at our accepted rate of 2.5 acres for each person.

It will be shown later how the United States with a similarly calculated improved farm area of 800 million acres reached the point of decreasing agricultural returns when the population was about 95 millions. A simple example in proportion leads to the conclusion that Argentina and Uruguay will cease to be food granaries for indigent peoples in other parts when the population has reached the 40-million stage. The further question to be answered is the probable date of this event.

At the end of 1919 Argentina had a population of 8,533,332 and Uruguay a population of 462,887. The increase in the last five years is nearly 10 per cent, an increase which because of the large proportion of young and vigorous immigrants included will tend to double the number of people in 30 years. But this is not the whole story. If one studies the trend of the increase during the past quarter of a century, it is clear that these countries have not yet reached the point of maximum acceleration. On the assumption, then, of a continuous Open Door policy, a reasonably steady government with no social overturns, and only the slightly decreasing birth-rate imminent in a Catholic people, extension of the growth curve gives 45 more years of increasing returns in agriculture. 1919 plus 45 marks 1964 as the date when overpopulated countries will cease to be boarded by oversea hotels unless current effective causes change. Naturally, if there are other great social overturns similar to Russia's, on the one hand, and an unforeseen speedy colonization of the tropics, on the other, the time will be extended. The assumption that increasing returns in mechanical industries will stretch it out by enabling the farmer to increase yields per acre has no justification whatever.

In the last great food reservoir of Europe, or rather of Great Britain, there is a very peculiar situation. British India is a grossly overpopulated country. Millions of squalid people, densely ignorant and unspeakably filthy, succeed in exporting really immense quantities of wheat, oil-seeds, tea, cotton, and jute, as well as smaller amounts of various other products of the soil. Probably nine-tenths of them never had enough to eat in their lives. Their margin of safety from starvation is practically zero. Still, they export food. Superficially it seems as if Malthus's famous law were shattered to powder.

The reason is the English. English brains have made a new India in 50 years. Famine-stricken, pestilence-smitten, cobra-bitten India has been given a new lease of life. An honest, efficient, sympathetic government has been established. A transportation system has been built that has banished the old periodic mass starvation. Schools are flourishing. Colleges have been founded. And, above all, a thoroughly modern department of agriculture is seeing to it that Indian farming is progressing in a most marvellous manner.

True, England has not done this wholly from altruistic motives. England needed food, and she saw in India a source of food. As payment for her executive ability, for her efforts at organization, she has taken food that the natives themselves could easily have used without overeating. She has profited; but so has India. Without England, India would have remained the prey of plague, famine, and wild beast. She would have had less than half of the population she now possesses, and her people would have been the world's choicest examples of a hopeless existence.

One can hardly have the temerity to predict how long the Indian cornucopia will pour out material wealth to England in return for English skill and knowledge. A lot of unruly prodigals now seem bent on leaving the paternal board because the word self-determination has so entranced them they fail to see the husks waiting in the distance. Presumably it is a question of politics and individual leadership. Certainly England cannot always keep the hegemony of India by force with a handful of soldiers on the ground and a base thousands of miles away.

The situation is this: British India has an area, as reported by the Survey Department, of 750 million acres, exclusive of Feudatory and Tributary States. Of this land, 200 million acres is now cropped. In addition, some 150 million acres of less-valuable land can be cropped later when facilities permit. Thus India is cropped at present more thoroughly than any other large country in the world. The country is an agricultural country wholly and solely. The growth in population under British rule is difficult to figure. The official estimates are:

Year	Area, square miles	Population, millions
1851	776,000	178
1861	856,000	196
1871	860,000	196
1881	875,000	199
1891	965,000	221
1901	1,098,000	232

The total population, including the Feudatory and Tributary States with an additional area of 360 million acres, was 294 millions in 1901, 315 millions in 1911, and slightly less than 319 millions in 1921. Thus it is clear that India has reached a point where it is impossible for her to increase rapidly by an excess of births over deaths. The total gain between 1911 and 1921 was only 3,786,000 people, or 1.2 per cent, less than one-tenth the annual rate of increase of the more vigorous European countries and of the United States. Conditions must be pretty bad where an annual birth-rate ranging from 40 to 55 per thousand of the population is so nearly equalled by the death-rate that the annual increase is only a shade over 1.0 per thousand. An intimation of what the people undergo is given by Wattal's[1] compilation of the average infant mortality for the years 1902 to 1911. It is as follows: Madras, 199; Bengal, 270; Behar and Orissa, 304; Punjab, 306; Bombay, 320; and United Provinces, 352 per thousand.

These few countries do not exhaust the current possibilities of food exportation, it is true; but in the remaining spots of the world, speaking in a broad sense, the food ledger just about balances. Countries have specialized agriculturally as well as industrially. They send out one article of diet and bring in another. In a few places where agriculture is practically the only occupation, food is exchanged for such tools and utensils as are absolutely necessary to keep production up to the existent level, even though the inhabitants would like to keep it in their own pantries. But as contemporary food sources they are practically negligible. Furthermore, most of these countries can never become really important world granaries, because all possible expansion can only take care of their own newcomers.

Look at the map of Asia, for example. Roughly, 75 per cent of Asia west of India and north to Russia is desert. It has been inhabited longer than most of the rest of the world. Politics and religion have kept the countries it in-

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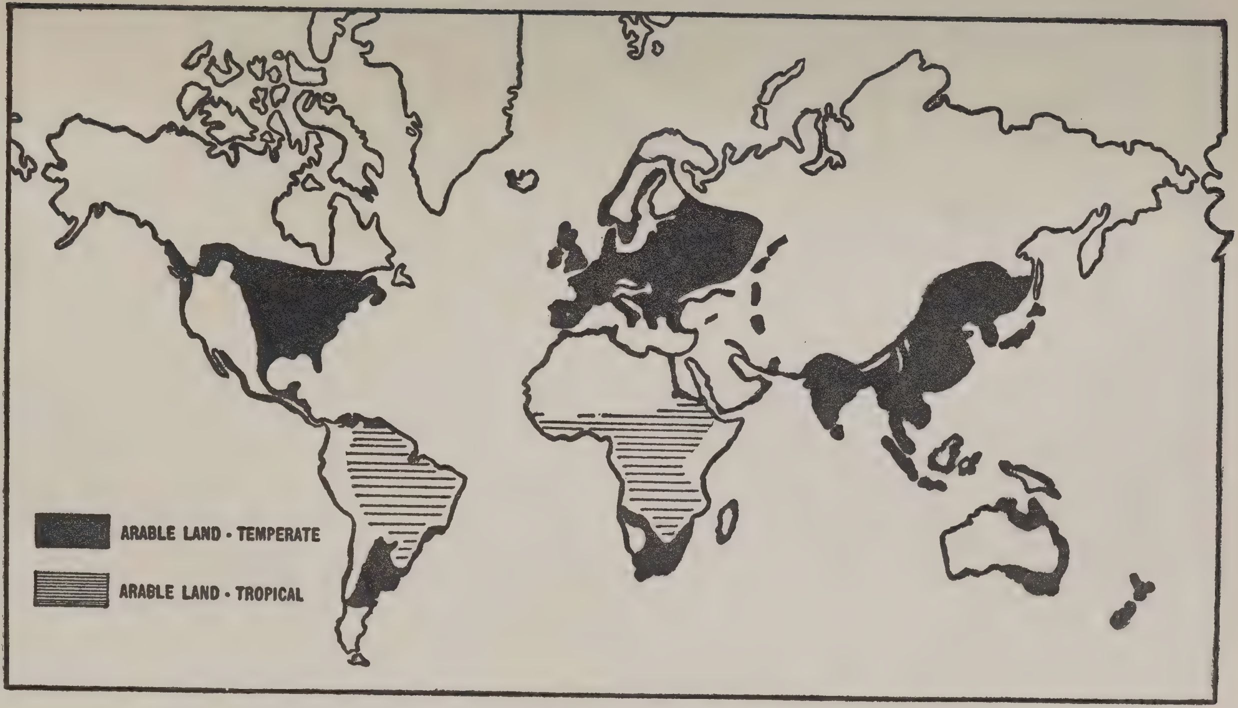
[1] Wattal, P. R., *The Problem of Population in India.* Bombay: Bennett Coleman, 1916.



ARABLE LAND - TEMPERATE
ARABLE LAND - TROPICAL

Fig. 4. ARABLE LAND OF THE WORLD.

cludes from progressing as rapidly as they might have done. Innately perhaps the inhabitants are not the most able of the peoples of the world. Yet they are inhabited by energetic races of no mean abilities. Why, then, have they not expanded? The factor that bulks larger than any other in the answer is the limitation of the food-supply.

Again look north of India, at Nepal, Tibet, and eastern Turkestan. Nothing but mountains. A rough, rugged country where the living is hard. And the hardy people who can make it their home will stay few in numbers.

Pass to the north. Trace out the line delimiting 55 degrees north latitude, marking a land area nearly the size of Europe. It will always remain sparsely settled with people. Winter is king, and rules with icy hand.

This leaves for Asia, only China, Japan, and the brown peoples living outside of India. There are about 100 millions of these extra Indian browns living on and around the Malay archipelago. They are under the tutelage of the white man, particularly the English and the Dutch, and his directive efforts allow them to increase faster than they would if left to themselves. According to some estimates, the annual increment is 1.0 per cent. This is probably too high by 0.2 per cent, but let us accept it. The point is that there is land in these regions to support some 200 millions or possibly 250 millions of peoples, under an efficient agricultural system such as obtains in Japan. But this land cannot be broken up overnight, as it were. These are tropical countries. Their progress in the use of industrial appliances will be slow. *Their production may be expected to rise, therefore, only as fast as the pressure of increased population makes it necessary.*

Japan is terribly overpopulated. On her little islands she now has some 56 million people, not including the 21 million natives of Korea and Formosa who are supposed to be ruled by the Mikado. Japan made such a rapid change from mediævalism to modernism, there was scarcely time to adjust the scale of living. With up-to-date transportation and storage systems and the best modern tools aiding their own wonderful agriculture, the result could have been foretold. Living in the same frugal way they have always lived with every member of a family working from twelve to sixteen hours a day, they have waxed great as an empire in accordance with the Napoleonic definition. The birth-rate has gone up; the death-rate has come down; and over 700,000 more Nipponese arrive every year than are gathered to their fathers. And the Japanese looking upon their islands find them small. They cast longing eyes on Manchuria and the Philippines. They rattle the sword and talk of Hawaii and California.

One cannot help but have a sincere sympathy with these longings of Japan, even though he is not likely to carry it to the extent of granting her a foothold in his own territory. They are simply a manifestation of the old saying: "An empty stomach has no conscience." Justifying the Korean invasion, a recent writer said: "The Japanese people must either die a saintly death in righteous starvation, or expand into the neighbor's back yard—and Japan is not that much of a saint." And the editor of the Tokyo *Yorodzu* says ironically: "How shall we dispose of our surplus millions? Our small country can hardly find room within its narrow boundaries to accommodate its yearly increase of half a million people. We cannot kill them wholesale, nor can we fill up the Sea of Japan and make dry land for them to settle on. We would like to go to Kansas or anywhere but Hades where we could escape starvation; but however hospitable America may be, she refuses to receive so many newcomers all at once."

Sympathy is for the common people, who work long hours for a mere pittance, however, and not for these publicists, whose effusions savor of jingoism. There is another way, a perfectly innocuous way, out of Japan's difficulties, without dispossessing her neighbors. It is population restriction.

Mrs. Sanger's recent trip was as important to Japan in its way as was that of Commodore Perry, but government officials turned their deaf ear. It is a pertinent question, then, to ask whether Japan really wishes to improve the economic situation of the people or is using their condition to make a bid for greater world-power.

Then, finally, China. What of China? Every statistician wishes he knew. As to China's career in the past, not even a satisfactory guess can be made. Chinese students themselves rated the population at 30 millions in 1700 and 360 millions in 1800. Such a rate of increase maintained during a century is very improbable, though it is not an impossible rate for short periods of time. In fact, it has been surpassed during one or two decades of the early history of the United States. Still, it is more than likely that China's early population was underestimated and her later census exaggerated, for China has not had immigration to swell her total, and mathematics has not been the strong point of the Chinese.

At any rate, the authorities of the Chinese Imperial customs were in no wise modest when in 1909 they gave out an official estimate of 439 millions. Apparently it was made solely by the use of the abacus and the multiplication table. In 1904, however, Mr. Rockhill, the American minister at Peking, made a very careful survey of the data at hand, and estimated the population at 270 millions. This estimate has been checked since by British officials and by several travellers, with the result that the statisticians of the world accept 325 millions to 350 millions as the best guess to-day for China's people.

China has probably increased very slowly during the past century. To-day her population may be stationary. It is so judged both by the director of the United States census and by the registrar-general of England. There is good reason for such a judgment. China is an old country with conservative unchanging customs. The agricultural system was built up centuries ago, and a very wonderful system it is. Those who would know it well should read King's *Farmers of Forty Centuries.* Her 200,000 miles of ancient canals are her sole means of transportation. Her industries have had no stimulus from the adoption of modern power machinery. Thus China has experienced none of the economic revolutions from which come population expansion. Her birth-rate is high. Experienced travellers have estimated it at 50 per thousand. But lack of elementary hygienic measures, backwardness in medicine, and absence of rapid means of transport, act as severe checks to population growth. Records of periodic pestilence and famine in which from 10 million to 20 million people have perished in a season are not uncommon. Trustworthy observers say that over 50 per cent of the children born die within the first year, and this in itself is a preventive of rapid growth. A birth-rate of 28 per thousand is considered to be relatively low, yet there are countries having such a birth-rate of which the infant mortality is only about 10 per cent. Their net birth-rate, therefore, is 25 per thousand; exactly the same as the net birth-rate of China, based on the above estimate. Now in even a hygienic country having no great increase in population, the death-rate after excluding infant mortality cannot be supposed to be less than 20 per thousand, and in a country where the people have a hard struggle for existence it is probably at least 23 per thousand. The net increase of China is not conceivably greater than 3 per thousand, therefore, and it may be zero. At 3 per thousand annually the increase is about one million, and this may be taken as the maximum estimate. The most probable value is less than half this figure.

It can hardly be true, therefore, as Paul Reinsch is inclined to believe, that China has a potential capacity of 600 million people on a territory one-third larger than the United States. There is a limit to the power even of such an industrious and frugal people as the Chinese. Such an estimate shows lack of familiarity with Chinese agriculture. Travellers often make the absurd mistake of supposing that because bandits and wild animals roam at large within striking distance of some of the Chinese cities, there is still a tremendous opportunity for expansion. The chief reason for these vacant spots is because they are too barren of soil fertility to be cultivated.

With the change which may come with her new system of phonetic writing, with a united government, with railroads, with modern storage facilities, China may be able to raise her numbers to 450 millions; but this potentiality has no bearing on the general question under discussion here. It does not change the fact that China to-day is horribly overpopulated, and travellers tell us that her people are passing over into Siberia, Mongolia, and Manchuria at the rate of a million a year.

Asia as a whole is overpopulated and seeking new outlets for its hordes. Europe as a whole is overpopulated and is sending out millions of colonists. Where shall they go?

The potentialities of Canada and Australia are practically negligible in the world sense, as has already been shown. The United States, though capable of supporting many more newcomers, has passed into the era of diminishing returns in agriculture, as will be shown later. What is there left? Africa and the Americas below the Rio Grande.

What is happening in these places? Mexico, Central America, and the West Indies have around 32 millions of people, and South America around 65 millions. In the climates made temperate by latitude or elevation, the white man thrives, and is increasing at about the same rate he averages on other parts of the earth. A great trek has started to Argentina, and similar migrations may be expected to some other parts. But to suppose that all of tropical America will fill up as rapidly as has the United States is to reckon beyond the facts. Food is produced rather easily by Mother Nature in the tropics, it is true; but on the whole the hot countries are not fitted for huge populations. Great heat evaporates energy as fast as it evaporates water, and this factor alone warrants us in not being too sanguine about filling the tropics rapidly. But this matter will be discussed later. The fact to be emphasized in this connection is the difficulty in erecting a margin of safety for large populations in hot climates. Bacteria and fungi thrive as well as pineapples, bananas, and cocoanuts. Storage and transportation of food is made very difficult. With such lands densely populated, the people exemplify a living from hand to mouth in perfect fashion. In addition, bacterial and protozoan human plagues are numerous and wide-spread. Infantile death-rates are very high from intestinal infections, and adult death-rates, always large from chronic diseases, spasmodically mount to terrible figures through epidemics having a virulence commonly unknown in temperate parts of the world.

All of these difficulties science will surmount after a time, I am fain to believe. The tropical Latin Americas will grow and prosper. Just what numbers they can support no one knows; nevertheless, one should not be extravagant in making estimates. There are long lines of precipitous mountains in the west, and large areas of swamp in the east. If the ultimate maximum is 300 millions, it will be a surprising triumph of human skill over difficulties. But this is not the point. The pertinent thought for our present consideration is this: The regions suitable for immediate colonization, the regions inviting rapid natural increase, are the temperate tips of South America from the tropic of Capricorn south to 45 degrees, and a few fertile plateaus of less than 5,000 feet altitude. Altogether this area is less than one-half that of the United States. The remainder must have a slower growth while awaiting the white man's creative genius. They must wait till harder scratching in his own habitat makes him willing to spend more time and effort gaining fortunes in places that will not tempt him otherwise. In other words, the white man, excluding the few reckless spirits who are always in evidence seeking new adventures for the mere joy of the quest, will not turn his attention to the tropics as long as there are fortunes to be won in other places. When the time comes he will go, but he will not set out till grim necessity drives him on. Perhaps he will be forestalled, think you. It is a possibility, of course, but it is not highly probable in any large way. Japan wants a place in the Sun, but not too much in the sun. Like ourselves, the Japanese are not particularly good colonizers where the thermometer boils over and the atmosphere is sticky. Still, if the Keep Out sign is raised elsewhere and Admission Free flares over the tropics, the Japanese may surprise us. The natural colonizer for such climates is not the Japanese, however, but the Chinese. If the Chinese ever get the roving disposition and are permitted to give way to it, then, in the words the street urchin has unwittingly purloined from the Bard of Avon, "there will be something doing."

We have left in reserve the Dark Continent. It isn't as large, practically speaking, as is usually supposed; but it is the real unopened treasure-house of the world. First one must slice off a chunk considerably larger than the United States to be labelled uninhabitable desert. Take the map and snip off the whole of Africa above the 15th degree north latitude, and very little has been taken having a rainfall greater than 10 inches. There is the northern fringe of Morocco, Algeria, and Tunis, and the narrow valley of the Nile, capable of supporting the limited population they now have in a rather meagre way; but to make up for this, there are the Somalilands and parts of Abyssinia which are almost as dry as the Sahara. And this is not all. A large irregular area comprising part of Angola, nearly the whole of the old German Southwest Africa, and a little of the western part of the Union of South Africa, must also be excluded.

Even with this hacking away of territory, however, there is a good deal left—an area, roughly speaking, twice the size of all the possessions of the United States, with some acres to spare.

Only about a tenth of this vast region is in the temperate zone, yet it is just this little portion that has been seized with avidity by white colonizers. The Union of South Africa, since the English and Dutch have buried the hatchet, has become one of the most progressive places on the globe. The colonists have flourished like the proverbial bay-tree. They have had plenty, and, having plenty, have increased and multiplied. In fact, the Union is the only part of Africa where either native or colonist is increasing at a rate comparable to the average European country. The whites are expanding as they did in our own country during the early nineteenth century, in certain parts probably doubling in a quarter of a century, and under the spur of white contact even the natives are increasing faster than in any other portion of the continent.

Thus the climate again rules with iron hand, for the southern tip of Africa is not the richest part agriculturally or geologically. The palm for real riches must be given to the interior. Take the Belgian Congo as an example. Tropical it is, cut by the equator. But the whole colony is a table-land, the lowest parts more than a thousand feet above the sea-level, and the higher plateaus in the south reaching an altitude of 4,500 feet. This altitude gives the country a varying climate, from temperate to subtropical, and it is said to be relatively healthy even now, when it has had little of the hygienic touch of modern science. Snow-capped mountains rise to 19,000 feet on the south and east, and from them flow great rivers to the west and north. Some enthusiasts have maintained it to be the best-watered country of the globe. The rainfall is from 40 to 80 inches, making it a potential garden. It teems with wild riches, both animal and vegetable; and the mineral wealth is extensive and varied. Gold, diamonds, tin, copper, and iron abound. Coal has been found on Lake Tanganyika. Oil and oil-shale have been located in several districts.

This description is not set down merely as an æsthetic appreciation of the Belgian Congo, however. It has another purpose. When Stanley wrote his African report, he made population estimates based on the number of inhabitants in the river-bank villages. Succeeding travellers used similar methods. The population of the Belgian Congo was estimated at 30 millions, and like estimates were made for the whole of the fertile interior. This is a rate of 33 persons to the square mile, and would give a quite respectable lot of people on the whole area of central Africa.

As the country became better known, these estimates have been revised downward. In 1915 and 1916 a census was taken of the most accessible villages of each district of the Belgian Congo. This enumeration gave a total of 5 millions, and those best informed on the subject place the remaining inhabitants at about one-half of those reported. The population, therefore, is most probably about 8 millions; and it is certainly less than 10 millions.

Here then is the finest part of tropical Africa, a country which if it could be properly exploited might support 250 people on each arable square mile, and the natives are crowded at the rate of 10 per square mile of total area.

Those who have read the blood-curdling newspaper tales of native ill treatment by the Arabs, the Belgians, and the Germans, may attribute the present state of affairs to this cause. They may put faith in Stanley's original population figures, and feel that depopulation has come about through slave-making raids and other means of attrition. On this subject I have had the advantage of interviewing Mr. Herbert Lang and Doctor J. C. Bequaert, who spent many years in this country collecting material for the American Museum of Natural History, and who know the region as well as any living men. They are of the opinion that the reports of the atrocities were greatly exaggerated. Conditions were bad. The natives were often ill treated and beaten, and sometimes murdered and starved. Individuals suffered; but from the collective point of view there was an even exchange. *The natives gained knowledge and obtained tools from the Europeans which enabled them to support more people on the land than was possible under their old social régime, and in the 30 years elapsing since ill treatment stopped they have increased in numbers and comfort beyond any previous period.*

These natives, belonging mostly to the Bantu tribes, are above the average for Africa in general health and intelligence. They are less warlike, more industrious, more docile, and generally more attractive than the members of many other tribes. Thus they are exceptionally well fitted for progress and expansion. *Yet they are practically stationary in numbers and have a density of less than 10 per square mile—presumably 25 per arable square mile.* Where could one find a better example of population reaching the Malthusian limit under a given type of society? And I am disposed to accept the opinion of my informants that the people of this region are increasing very slowly, if at all. It not only is the opinion of expert and careful observers, but it fits in with collateral data of other travellers. The birth-rate does not appear to be high, and the female reproductive period is very short. Infant mortality is excessive, and the general mortality rate is considerably greater than that of the white race under similar conditions. Furthermore, several preventive checks to population have been more or less common from time immemorial.

There seems to be a real lesson in this revision of ideas regarding Africa. If the Belgian Congo, which with some of the surrounding territory is by all odds the finest part of the continent, supports only 10 persons per square mile, is it likely that the habitable remainder does better? Now in Africa's 12 million square miles, 4 millions are desert, leaving room for a population of 80 million natives, to which one may add the 5 millions or so of whites. This is a large reduction from the 200-million estimates made by certain facile writers, and is even a marked shrinking from the 120-million estimate made by the more conservative of our population statisticians. But more important still is the conclusion to which the facts point in regard to the natural increase of the black man. When left to himself in a naturally rich country, his ability for industrial organization is so limited that population comes practically to a standstill at a density of 10 to the square mile—one-tenth of the average density possible to either the yellow or the white race.

Africa then presents the greatest remaining opportunity for white colonization. Its topography throughout very large portions of the interior—roughly nearly 3 million square miles—makes it much more favorable for white settlement than any other large, sparsely populated tract. There seems to be a probability that Europeans of the Latin countries can thrive, since some of the settled, prosperous parts of Brazil have about the same latitude and elevation. The relative proportion of such land in Brazil and in Africa below the equator is very different, however: in Brazil over eight-tenths of the surface is below a thousand feet in altitude; in Africa nine-tenths is above a thousand feet and eight-tenths above 2,000 feet, yet scarcely any of the land is precipitously mountainous.

This presentation of the present world situation as regards the gross facts of population has been sketchy. It was necessarily so. The evidence from geography, climatology, agriculture, and anthropology, not to speak of religion and politics, on which one must base conclusions regarding the simplest population dynamics, is so voluminous that only a few of the salient points could be touched. This is said not in apology, but in explanation. No seven-league boots were used in our exploration of this field. The journey was made patiently and carefully with the ordinary paraphernalia. And if the reader is sufficiently interested to repeat the excursion, his trip will have the same result. He will be driven to the following conclusions.

Temperate Europe and Asia taken as a whole are overpopulated. Only Russia can take care of many more people. Tropical Asia is in the same situation with the exception of some of the islands of the Malay Archipelago. The remaining tropics are undermanned from the view-point of a high civilization, but most of the peoples now inhabiting them are increasing slowly because they have reached the barriers shutting in their particular race and social status. The European countries are increasing rapidly, not because they have more room in their home lands, but because industrial expansion permits it through the fact that there have been and still are undermanned countries suitable for extensive agriculture, giving large returns per capita and small returns per unit of land to any efficient, energetic people. These countries are North America north of the Rio Grande, the lower parts of South America and Africa, and Australia and New Zealand.

Of them, the United States is the only country having a large area capable of maintaining many people. And the United States has passed the era of great expansion and has entered the era of diminishing returns in agriculture. It can support more people, and many more immigrants will come if they are permitted to enter, but the time of easy riches has passed and the time of struggle and competition has begun. After the United States in potential power of expansion come temperate South America, Canada, Australia, and temperate Africa in this order. But none of these territories is capable of an expansion greater than that of the United States during the *first half-century of its growth* except the first.

There remain the tropics. Tropical South America, with the exception of very limited areas of table-lands, and the low regions of Africa are unsuited for European colonization at present. Whether their conquest can be made by any members of the white race is a problem that only time can solve. But one can draw this conclusion legitimately even now. European colonization of the real tropics will not come until dire necessity forces it under any circumstances. It will not come until population pressure is severe in all temperate countries. This gives a respite of less than half a century at present rates of increase, of less than a century at the rate of increase which probably will ensue during that time, and throughout most of the period the severity of the struggle in these countries will be marked. Utilization of the high table-lands of tropical Africa seems the only solution for reception of the overflow during this period.

I speak of European colonization during this time, because European countries, though no more overpopulated than India, China, and Japan, at present have the only chance to expand. The sparsely populated countries are under the complete control of Europeans or of their descendants. No place of any great area, agriculturally speaking, is left either for China, India, or Japan. If these three countries obtain the opportunity to expand (I will not say relief from overpopulation, because there is no such thing except by preventive checks), it must be by that difficult procedure the overturning of race prejudice, which really is the instinct of group-survival, or by conquest. Neither of these methods seems likely to meet with success in the case of India. Presumably the same may be said of China and Japan; but the possibility of success is greater. Japan is increasing rapidly, China is increasing slowly. Japan is using very skilfully every weapon of diplomacy to obtain her ends, and is rattling other weapons as an additional argument. What may happen if China pushes the use of her new phonetic writing and makes the full use of modern knowledge of which she is capable is a riddle not to be solved to-day.

There has been no special mention of the arctics in this discussion, though their prospective food production has been studied carefully in estimating the resources of Russia and of Canada. In the narrow sense, the production of vegetable foods for human consumption, there is no need to mention the arctics, since their contribution will always be negligible; but they have a unique possibility of furnishing a very considerable meat-supply that merits attention because of the likelihood of underestimating it in certain quarters and of overestimating it in others.

Less than 20 years ago a few reindeer were imported for trial in Alaska. They did so well that Mr. Grosvenor, the editor of the *National Geographic Magazine*, shortly wrote an article prophesying reindeer meat for the American market within 25 years. The statement was received with ridicule, the shouts from Alaska itself being especially shrill and strong. But Grosvenor was right. The descendants of the little reindeer herd now number 250,000, and reindeer meat was sold in American shops five years ago.

Now the pendulum swings the other way. Government animal husbandmen have studied reindeer meat production long and carefully, and their reports have been so encouraging that people have begun to exaggerate the future prospects. A statement to the effect that in certain parts of Alaska one reindeer can be raised on each 30 acres has caused active use of the multiplication table to prove that there are probably 2 million square miles of reindeer grazing-land in Canada and 5 millions in northern Eurasia, and that thus 140 million animals can be raised in the arctics forthwith. Since this is an amount of meat almost equal to the present mammalian meat production in the United States, it bulks pretty large in the imagination. Unfortunately, there are good biological reasons for believing the estimate to be about ten times as high as can possibly be realized.

In his remarkably interesting and instructive book, *The Friendly Arctic,* Mr. Stefansson has recently given this matter a serious turn, by unconsciously leading the reader to think the arctic is a second Garden of Eden. It is a wonderful tribute to the author's ingratiating style. What he means to do is to point out, with a wealth of illustration born of intimate experience, how unsuspectedly rich and varied to the uninitiated is the arctic flora where the land elevation is not too high, what a large quantity of meat can be produced on this vegetation by growing reindeer, and what comforts as well as what hardships await those who go to tend them. The trouble is, he succeeds in painting the cordiality of the arctic in colors all too glowing. He makes us want to purchase tickets and emigrate immediately.

Mr. Stefansson has brought many new facts out of the northland, and for these we are his debtors; but since the essential facts upon which to base an estimate of its productivity are as readily available to the armchair student as to the explorer, there is no good reason for assuming a criticism of his conclusion as to the amount of service to humanity to be rendered by these territories to be either impertinent or unsound. There are extended accounts of the wild flora and fauna, there is accurate knowledge of the effects of temperature variations and of the relative length of day and night on plant life, and there are bulletins of our own government scientists, based upon experimental evidence, on the subject of raising reindeer.

An example of what I wish to call in question is the idea he puts forth about the effect of long hours of sunshine on plants. He writes as follows in the *World's Work:*

> Not being a botanist, I do not vouch for the statement, which I believe to be true, that plants not only stop growing during the hours of darkness but also are sluggish in resuming their growth when the first beams of the morning sun strike them. It is something like starting a motor-car that has been allowed to get cold. In midsummer a plant has 13 growing hours out of the 24 in Texas, 14 or 15 in Minnesota, 20 up on Great Slave Lake, and 24 on Great Bear Lake. Another way of stat-

> ing it is that in the South the plant works single shift, and in the North double shift. A plant on the Arctic Circle, therefore, has almost as much growing time in one month as it has in two months in the Southern United States.

This statement proves the author's admission that he is not a botanist. The truth is just the opposite. *Plants take in and elaborate their crude food materials during the day, but they do most of their growing at night.* Plant physiologists have tediously plotted many a curve to find this out.

I do not want to make too much of such a slip, but it shows that it will not do to jump at a conclusion. Botanists do know the plants of the arctic; they know them rather well, thanks to the labors of enthusiastic explorers like Mr. Stefansson. Mr. Fernald of the Gray Herbarium of Harvard University can look at one of Mr. Stefansson's plants and tell just about where it was obtained. Botanists know that some of the native arctic plants have evolved the ability through natural selection to get along without the amount of darkness needed by their relatives of the temperate zones, but they also know that they cannot elaborate twice as much food material because they have that much more sunlight. The plants pay for this deprivation of sleep by being built small and close to the ground. They go through their life cycle quickly, but their net weight per acre is more nearly in proportion to their growing time.

For botanical reasons, therefore, I believe the estimate of one reindeer for each 30 acres over great stretches of land to be about three times as high as it ought to be. These animals have to live through a long hard winter on the produce of a very short summer.

Again, for geographical and for certain practical reasons, into which we do not need to enter here, I feel that an estimate of 7 million square miles of arctic grazing-land where reindeer will actually be raised—no matter how much of an urgent need there be—is not within the bounds of probability. If 2 million square miles are ever thus used, it will be about as surprising as the realization of perpetual motion, and this under favorable conditions will produce from one-tenth to one-eighth as much meat as is now being raised in the United States.

After all, why fuss about whether the arctics will produce as much meat as the States, or only a tenth as much? Mr. Stefansson says about his own estimate: "As an absolute quantity this means a large supply of meat, but relatively to the demands of the world as the world is to-day it is not large. With reference to the world of a hundred years from now, if we avoid destructive wars and do not adopt birth-control, this supply, vast in itself, will be insignificant."

He sees clearly the course of events. With reference to the future, he writes thus: "People who do not consult the census returns are in the habit of laughing at the Malthusian doctrine of population. But those who look at the census returns do not laugh. His was not a prophecy but a mathematical calculation, and it is coming true as rapidly as he said, and as inexorably as things do which go by mathematical law."

He has been at some pains to show how a future supply of meat may be obtained at a time when there will be no meat in the temperate regions except as a luxury for a favored few. And in his final sober conclusions he performs a real service by telling us not to let our hopes run away with our good sense by endeavoring to practise field agriculture where the Frost King laughs in our faces.

"My own family," he says, "now has a farm so far north in the Saskatchewan," it really is only about a quarter of the way up in Canada's northland, "that we lose the wheat-crops by frost often enough to take up all the profit. It is foolish for us to continue the attempt so far north, and eventually no one will try it."

"Now and then the newspapers have headlines about somebody discovering a new kind of wheat that will ripen in five or ten days less time than some other. These discoveries are chiefly of academic interest, for the northward limit of wheat or of any other cereal is determined not by early autumn frosts but by the sporadic midsummer frosts. There is not much point in breeding an earlier kind of wheat. There would be great point in doing what probably cannot be done, the developing of a frost-resisting plant. Until that is accomplished, the northern limit of profitable wheat cultivation will remain about where it is now, and is more likely to move south than north."

CHAPTER V

RACIAL PROSPECTS AND RACIAL DANGERS

THE old Norsemen must have been a stolid crew destitute of humor to have accused their gods, who had the wonderful opportunity of witnessing the perpetual burlesque staged and acted by the human race, of finding it necessary to appoint an official mirthmaker in the person of Loki. But no; they were merely self-complacent, like ourselves. It takes a deal more effort for a hard-working member of the cast to laugh at the performance. Even with a Rabelais or a Mark Twain, the demands of the ridiculous are often swallowed up by the pathos of the situation.

Man is a queer budget of paradoxes. His chief wish is to survive, both in person and by deputy through his children. Thinking to gain these ends, he will support his family against a neighbor, his class against other classes, his country against another, his race against the world. The incongruity of these various groupings for achieving the result desired disturbs him not at all. Witness the universal ambition throughout the white race to dominate the world, despite the fact that among its different subdivisions strife has been almost continuous from time immemorial. Recall the unimpaired race-pride of the Oriental aristocrat, held through centuries of intraracial conflict.

There is great journalistic activity in both Europe and America over the question of the final outcome of these aspirations of the primary races. A school has arisen which believes the present overwhelming numbers of the world of color to be a serious menace to white civilization. It is impossible for any member of the clan not to be stirred by the appeals of its adherents. One is compelled to sympathize with their arguments against internecine strife, with their demand that the white nations get together in a spirit of helpful co-operation, with their entreaty for them not to be cajoled by subtle diplomacy into an auctioning off of birthrights.

Aside from such emotional reactions, however, the question, Who shall inherit the earth? must form an integral part of any serious study of population. The importance in the public mind of racial prospects cannot be denied. If one hopes to show that the spread of knowledge has opened the way for an equating and balancing of urges sufficient to enable man as an individual to avoid singeing his wings in the flame of overpopulation, he must be able to prove that acquiescence to the proposal will not deprive later generations of their heritage. Otherwise publicists will seize the opportunity to push the old militaristic argument of individual sacrifice for the good of the race. They will demand speedy, continued population increase at all hazards, that the white man may hold his own. Let us examine the matter dispassionately by the aid of the census returns.

One of the ablest writers among the exponents of the doctrine that there is a very real danger of the colored races supplanting the white race is Lothrop Stoddard. In fact, his stirring book *The Rising Tide of Color*[1] is perhaps the only example of an effort to substantiate such views by statistical methods. The validity of the conclusion that white world-supremacy is imperilled must therefore rest upon the precision of these data.

Stoddard accounts for a total world population of 1700 millions in 1914 by dividing them into 550 million whites, 500 million yellows, 450 million browns, 150 million blacks, and 50 million "red" yellows and unclassified strains.

In my own time-consuming detailed study of world population and its growth, the figures obtained were 710 million whites, 510 million yellows, 420 million browns, and 110 million blacks, making a total for the world as of 1916 of 1750 millions. These compilations were made from the official returns wherever available, and were checked with those of the United States Bureau of the Census, with those of the registrar-general of England, and with those recorded in *The Statesman's Yearbook*. Moreover, they agree rather well with the estimates made by Professor Thompson for use by Pitkin in *Must We Fight Japan?*

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[1] N. Y.: Scribner's, 1920.

Even after allowing for the two-year difference in the dates of the compilations, there is a considerable divergency in these two groups of figures. In Mr. Stoddard's estimate there are 1150 million colored peoples and 550 million white peoples. In my estimate there are 1040 million colored peoples and 710 million white peoples—the latter being distributed as follows: 465 millions in Europe, 185 millions of European origin, and 60 millions of non-European origin. But the question of mere present-day numbers is not a matter of great importance. One of the lessons of the Great War was that trained high-grade brains are what count. If Germany had been surrounded solely by Russian hordes, the result never would have been in doubt. So a few million less whites and few million more blacks matter not. The real point at issue is this. Says Stoddard: "There can be no doubt that at present the colored races are increasing very much faster than the white. Treating the primary race-stocks as units, it would appear that whites tend to double in 80 years, yellows and browns in 60 years, blacks in 40 years. The whites are thus the slowest breeders, and they will undoubtedly become slower still, since section after section of the white race is revealing that lowered birth-rate which in France has reached the extreme of a stationary population."

Let us look at the annual rates of increase resulting from these assumed rates of doubling. They would be as follows:

Race	Number in millions	Rate increase per thousand	Annual increase
White..........	550	8.7	4,780,000
Yellow.........	500	11.6	5,800,000
Brown.........	450	11.6	5,230,000
Black..........	150	17.5	1,625,000
Total........	1650		17,435,000

This is indeed a terrifying sum total from the white viewpoint. There is an annual increase of over 12 millions of the colored peoples to less than 5 millions of the whites; and the disproportion would be still greater if the probable increase of Amerinds and of the unclassified races were to be figured in.

Fortunately, a statistical analysis of the census returns does not bear out these conclusions. The average annual increase of 8.7 per thousand for the white race is much too low, while each of the estimates for the colored races is very much too high.

Extensive census returns are available for practically all of that part of the white race having a European origin. For the remaining members of the clan, numbering about 60 millions in all, there are official estimates. It is not difficult, therefore, to calculate a weighted average for white increase. For the first group, Knibbs has made it out to be about 11.7 per thousand annually for the five-year period 1906–1911, without allowing for a few minor points such as the differential increase of whites over blacks in the United States. My own calculation, making these corrections, is 12.0 per thousand annually for the quinquennium 1909–1915. Another method of making the estimate, viz., by considering reports of actual births and deaths, gives a weighted average of between 13.0 and 13.5 per thousand annually. The non-European whites are increasing much more slowly, probably at a rate of about 8.0 per thousand. Thus, at the lower estimate the main body of the white race tends to double in 58 years, while their Asiatic relatives tend to double in 87 years.

Admittedly the census enumerations as well as the vital statistics in countries where the colored races dominate are usually imperfect. No pretense of accuracy is made except in Japan, India, Ceylon, Java, Jamaica, and the Philippines. But in other countries competent persons familiar with the inhabitants through long periods of time have made estimates not to be despised. And in most regions where there have been close racial contacts, such as India, the Union of South Africa, and the United States, accurate comparisons can be made of the varied effects of environment, of social custom, and of heredity on population increase. The rates found for the brown race by utilizing the census returns and vital statistics of India, Ceylon, Sumatra, Java, and the Philippines vary from 1.6 per thousand to 2.5 per thousand annually. The recent census of India points to the lower value as the most probable one. The rate accepted for the yellow race, 3.0 per thousand annually, is an estimate based on the official figures of Japan, Korea, and Formosa, after allowing China a rate of increase of 1.5 per thousand. This is a higher rate for China than most statisticians believe to be probable. In fact, if China is taken to be stationary in population, as the census officials of the United States believe, the rate of increase for the yellow race cannot be over 1.5 per thousand annually. The rate accepted is certainly adequate for the yellow poor relations of the New World. In the case of the black race the rate of 5.0 per thousand taken from the meagre data for Africa and from the more satisfactory returns for the negroes of the United States and of the West Indies is undoubtedly too high. It gives too great weight to the relatively high rate of increase in localities where the negroes are under white tutelage; though even in Jamaica, where the paternal care of the British Government has developed a veritable forcing-house for pickaninnies, the rate of growth is such as to take at least 50 years to double their numbers. One has the feeling, after studying recent reports on African conditions, that 2.0 per thousand annually will be found to be more nearly the correct figure when all the facts are known.

The following table presents the total figures for the world as of 1916. Those for gross population are thought to be as accurate as it is possible to make them at the present time. The probable error is very nearly plus or minus 30 millions. The rates of natural increase, though made after careful study, lack somewhat of the precision of the population figures. They are not even the rates that are considered to be the most probable. *They are the rates obtained when white increase is put at the minimum for which there is any evidence, and colored increase at the maximum.*

Races	Population millions	Annual increase per thousand	Annual increase millions	Number of years to double
White, European origin....	650	12.0	7.80	58
White, non-European.....	60	8.0	.48	87
Brown..................	420	2.5	1.05	278
Yellow.................	510	3.0	1.53	232
Black..................	110	5.0	.55	139
Total..................	1750		11.41	

Now examine the results cited, wherein the white race increase is placed at its lower limits and the colored races are given the benefit of all doubts. The white race is even to-day numerically superior to any other. Its growth is remarkable. Over two-thirds of the total yearly increase of world population is white. To 8 million additional whites, there are only 4 million additional non-whites. Before 1950, therefore, unless some radical and relatively permanent overturn of world affairs occurs, the white race will have a true majority instead of a plurality. This will be true notwithstanding the fact that white birth-rates are falling in many countries, because death-rates have also receded. Its present momentum will carry it 30 years, even if the birth-rate drops twice as fast as it is dropping at present. Only two things can prevent the consummation; either there must be an extensive and long-continued economic breakdown worse than that which has occurred in Russia, or there must be a complete immediate conquest of large areas of unused fertile soil by the only efficient colored race, the yellow.

In view of these facts, there is little need to emphasize the possibility that our figures for rates of increase should read 13.0 or more for the white race and 2.0 or less for the colored races, when both sets are averaged. In this case, the annual increase of white peoples would be 9.23 millions and the annual increase of colored peoples 2.08 millions. My personal belief is that these last figures are more nearly correct than those cited in the preceding table, but I have no wish to appear to exaggerate. Let us therefore turn to a consideration of the relative status of the races and their future prospects.

The white race is increasing rapidly. Why? Simply because it has political control of nine-tenths of the habitable globe, and because it has the ability to utilize the space it holds. The western hemisphere is completely within its grasp, and on the greater portion of it white populations can thrive. The tropics, represented by Central America and the interior of South America—roughly a territory one-third larger than the United States—are not congenial to it at present; but most of this country will be controlled by a white barrier at its outer limits. In the eastern hemisphere it holds all but eastern and southern Asia, the Malay Archipelago and Oceania, racially as well as politically. This statement may seem to be somewhat exaggerated; but practically it is not. The black zone simply does not count. The negroes, even with the help of white contact, cannot compete against white expansion. They will increase but slowly if at all during the next century, and within that time the white race will have colonized such parts of Africa as it finds possible to utilize. The white race, therefore, will be limited in the immediate future only by its efforts toward a superior culture that will hold away the results of overpopulation.

The various elements of the brown race may indeed throw off the white political yoke. Peacefully and gradually, or resentfully and suddenly, it may be expected that the brown men will finally shift for themselves. The white race will try to hold them in line as long as they are able to export food, but this cannot be for long. Nevertheless, a sweeping political change of this type will mean no united Malasia crossing swords with the remainder of the world to seek to gain new lands. Individuals will wish to migrate, and will seek to break down by diplomatic representations the barrier to brown immigration set up in the undermanned tropics subject to white control. The effort will avail little. If Nordic labor will brook no competition from such sources now, it is not likely to give way when the economic stress reaches a higher peak. Clamorous propaganda will be the beginning and the end of the excitement. As Mr. Pitkin might express it, armed competition with the white man is unthinkable by a race living in a country where the sun burns the will-power out of every man, where time is long and life is cheap, and constructive thoughts are little moths that flutter briskly in the evening and die at sunrise.

There is good reason to suppose that realization of the aspirations of the malcontents of India and the Philippines is not going to be the broad road to progress they expect. Such ability as exists in India comes from the age-long current of white blood which has not been wholly subdued in all the veins. The dominant individuals of the Philippines are those with Spanish, Chinese, and Japanese names somewhere among the branches of the ancestral tree. The great voice of the common people will simply applaud automatically a change of governors when this millennium comes. And does any one, do even the Nationalist leaders, really believe the change will be an improvement? Our own political fortunes are hardly guarded as efficiently as those of the Filipinos. Britain fumbles about with her home troubles more confusedly than with those of India. Will the natives of Malasia teach us how to manage our own concerns by setting a bright and shining example? Such a thought is rather hard on one's imagination. One is more likely to find that there will be a decrease in efficiency and a fall in agricultural production, and that population will early strike a dead level because of meeting the subsistence limit sooner than would have been the case had no political change devolved.

Huntington[1] has disposed of the bugbear of black-brown world domination in that novel study *Civilization and Climate.* His multitude of varied observations establish this thought: men can reach a high degree of efficiency in active constructive work only where there is a moderate humid temperature with sufficient daily variation to act as a physical stimulus. Some of the sluggishness of the tropical races may be due to the attacks of animal parasites which can ultimately be eradicated. But by no means all of it is attributable to this cause. Continuous heat, day and night, saps the energies and breaks the will. Labor efficiency drops almost to the absolute zero. From three to five men clutter up the ground slowly carrying out tasks easily accomplished by any ordinary individual in the bracing air of the north. And, says Pitkin: "Parallel with this runs a curious tendency to talk big and do little. There is always the impulse to do things. This impulse is, when elaborated, a series of bright ideas. But when the bright ideas have all been developed, it is time for action. The work of the central nervous system is largely over, and the toil of the muscles begins. But here, alas, the bright ideas encounter a thermometer that insists upon registering 90 in the shade, week in, week out. The limp body refuses to carry out the orders of the mind. And the bright ideas go glimmering. This is also the white man's salvation."

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[1] Huntington, E., *Civilization and Climate.* New Haven: Yale U. P., 1915.

Now this climatic limitation of initiative is a remarkable thing. It may account for more of the white man's success in life than one would like to admit. Why the temperate regions were not settled sooner in the history of mankind is a deep riddle; but the fact of the matter is that the regions with a stimulating climate are now and always have been the regions where progressive ideas are carried out. And to-day the black and the brown races live entirely in the zone of low initiative, while the only members of the yellow race living in the zone of real thought and work are the northern Chinese and the Japanese.

Thus the conception represented by the following quotation fron W. E. B. Dubois,[1] the negro firebrand, is not one with which to frighten any but children and professional peril-hunters. Writing of the colored peoples, he says: "These nations and races, composing as they do a vast majority of humanity, are going to endure this treatment just as long as they must and not a moment longer. Then they are going to fight, and the War of the Color Line will outdo in savage inhumanity any war this world has yet seen. For colored folk have much to remember and they will not forget."

There are several interesting things about this quotation, to which it seems worth while to draw attention. In the first place, it calls to mind as an apt reply the peace offer Mark Twain's nineteenth-century Yankee and his trained followers proposed to make to the whole massed chivalry of sixth-century England: "You fight in vain. We know your strength—if one may call it by that name. We know that at the utmost you cannot bring against us above five and twenty thousand knights. Therefore, you have no chance—none whatever. Reflect: we are well equipped, well fortified, we number 54. Fifty-four what? Men? No, *minds* the capablest in the world; a force against which mere animal might may no more hope to prevail than may idle waves of the sea hope to prevail against barriers of England."

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[1] Quoted by Stoddard, *l. c.*, p. 14. From *The Atlantic Monthly*, May, 1915.

One hears such outbursts as this of Dubois, solely from the mixed bloods. Only when there is white blood in his veins does the negro or the Malasian cry out against the supposed injustice of his condition, and then only when in contact with numerically superior whites. The increased ability of the mulatto comes to the front in a negro commonwealth, as one sees in Hayti. There he leads his darker countrymen with pride glorified and great. But white germplasm in the negro complex spurns its hopeless situation when in contact with the dominant race. The mental solace to a superior individual of mixed ancestry in thus giving way to a boast which he realizes has no hope of fulfilment is obvious. It has been quoted, neither as an example of a certain type of psychological reaction, nor with the idea that it needs an extended argument in refutation. Both heredity and environment combine to render black-brown threats powerless, and as to yellow leadership of a colored race-combination, it is mythical. Race pride is not limited to blond peoples. The Japanese and the Chinese despise each other, and both feel superior to the brown and the black, and the Hindu has more caste tabus than either. The thought aroused by Dubois's words is more important, as it concerns the imputation of the colored races suffering grievously and long, crushed under the iron heel of white ambitions. In the narrow sense this is true; broadly speaking it is a falsehood black as night. Individuals have suffered in every epoch; but there have been no racial boundaries to injustice. Self-preservation has been a stronger instinct than race-preservation. The sins of the white race against the colored, be they red, brown, or black, are trivial lapses from fair play compared with the evils arising from social struggles within their own nations. Is it not fair, then, to scan the benefits of white control once in a while, not in a sterile search for altruism in white world policies, but merely in the interests of truth?

Let one examine the vigorous growth of Java under the Dutch, the wonderful progress of India since she joined the British Empire; or, better still, compare the Afro-American with his cousin of Hayti or of tropical Africa. One and all these peoples have prospered through their contact with European civilization. The more intimate and direct the alien control, the greater is the tide of achievement. The more thoroughly one studies the population question, the more forcibly it is impressed upon him that white brains and initiative have so improved the resources of such races, that not only have millions more of their people passed over the bridge of life than otherwise would have been possible, but that these millions have lived more comfortably and peacefully.

I hope this digression, if indeed it has been a digression, will be pardoned. The discussion had turned upon racial prospects. Reasons were given for assuming the probability of white expansion and of black and brown restriction. There remain the progressive, alert, and ambitious Nipponese and the hitherto conservative but inherently able inhabitants of northern China. They have filled up their homelands and are looking for some place to go. And they do not care whether the door-mats say *Welcome* or *Beware the Dog*.

Now at present these two peoples have about the same love for each other that the devil is reputed to have for holy water. They are not likely to unite in any aggressive projects in the very near future, nor are they likely to perpetrate successfully a peaceful penetration—if together. Aggressive projects directed against a far-off base may be dismissed as day-dreams, anyway. Neither Japan nor a rejuvenated China could wage an aggressive war successfully against a distant part of the world. Such things must be given up as hopeless after the experiences of the World War. The only success the citizens of the Far East could have in such a game would be to provoke others into a home attack upon them. Assuming then that both the white race and the yellow race retain such common sense as has been vouchsafed to them, war talk may be left to jingoes and yellow journals. And even if wars should develop, they cannot possibly settle the population problems under discussion.

If the yellow race obtains room for expansion in distant lands, it will be through diplomatic victories, and the prospect of these is not great. The people of Australia, South Africa, and California have spoken in no uncertain terms on the subject. Their decisions have not been made because of race prejudice in the narrow sense. They take their stand primarily for economic reasons. They wish to avoid the crushing competition of peoples accustomed to toiling 16 hours a day. But whatever the basis of the objection, it is not likely to be removed by the most persuasive argument ever conceived. Even the humanitarian receives this answer to his subtle appeal to human sympathy: "Why should we ruin our own and our children's prospects of comfort by receiving this overflow carelessly spawned on the world by unthinking incompetents who should know the crowded conditions into which their children are born? Let their own governments take the matter in hand, and spread suitable propaganda aimed at restricting these people to their limits of production." The answer may be crude, but it is straight to the point. In these territories Nordics have possession, nine points in law and in fact; and they will keep possession.

Some of our pro-Japanese Americans have settled the whole question in theory by offering the tropics for colonization. This generosity is a little dulled by their not having possession of the property they so kindly hand over, and in addition this solution lacks somewhat of practicability because the Japanese have never been conspicuously successful in the tropics and have no intention of being relegated to them.

A less improbable development would be for the Japanese or the southern Chinese to be received into those parts of Mexico, Central and South America made more or less temperate through elevation. Both races have had a fairly cordial welcome into parts of Mexico, and future immigration of this kind would seem to depend largely upon certain economic eventualities. One may illustrate the probable course of events, however, by recalling the situation as it has progressed in California. In the early days when the Chinese were coming over in goodly numbers and underbidding home talent, there was great hue and cry against them. Afterward, when the effect of the Chinese exclusion act came to be felt, and the receding Chinese wave was followed by a succession of ripples bearing Nipponese, the tune was changed. A friend from the Sunset state said to me only last summer: "What a wonderful people the Chinese really are, so efficient, so kindly, so thoroughly honest; but out upon the Japanese for a nation of tricksters and rogues." Similarly the continued welcome either of Chinese or of Japanese below the Rio Grande would appear to depend wholly upon the effect their coming has upon the present struggling inhabitants. If the invaders make this struggle noticeably harder, and retain their ingrained clannishness so that they present an attractive mark for the arrows of the discontented, they will be ousted. If, on the other hand, they placate the powers of church and state, intermarry with the more intelligent classes, and by a far-sighted policy help to develop the resources of the country for all its people, it is difficult to see why they might not continue their entry over the period of increasing agricultural returns.

No one who is acquainted with both Latin Americans and Japanese would think this plan practicable for a moment; but with the Chinese it would not be impossible. It must be noted, however, that in any case this outlet will not be large enough to afford even a temporary population relief for eastern Asia. Nor does it permit an increase of the yellow race, as such, in the Americas. The countries of the New World are already rather well stocked with nondescript hybrids numbering in their ancestry some Asiatic poor relations—the American Indians. Additional blood of a better grade from the same original stock will be an example of what the cattlemen call "grading up."

After summing up the prospects of the yellow race for expansion, therefore, one finds them less bright and definite than he had been led to expect. The essential requisite for expansion is new land. Without new land, industrial progress means little but temporary hypertrophy stimulated by imported food, tumorous outgrowths that the doctors of law and economics will find difficult to reduce painlessly to normal when foreign food packages are no longer offered at the marts. Some few aids to augmented food production per unit area will be discovered, and these will permit greater population density. Better facilities for distribution will lessen the probability of famine. But these are minor factors. For permanent expansion there must be new land.

New land is under white control, and the rapid growth of native whites will heighten their purpose of keeping for themselves all that they can use. Whether they will persist in the same line of action in the tropics, no one can say. Presumably this will depend upon political policies which are not always consistent, rather than upon economic pressure which never varies in its demands. The immediate prospects of the yellow race thus shrink to what can be done in the way of colonizing neighboring countries. Mongolia and Manchuria will fill up, and overtures will be made to the Philippines and to the Russians in Siberia. No matter what the first reaction of the present inhabitants or the dominating interest to yellow colonization of the last two countries, it seems to me beyond question that ultimately there will be a more or less peaceful Oriental conquest. But what then? The actual inertia of large bodies of illiterate people will be difficult to overcome. Positive checks to population will continue in force for a long period of time, since one may expect no great change in Oriental habits for the next century. At the end of this century the white race will probably number between a billion and a quarter and a billion and a half. It will fill the temperate regions and the better parts of the subtropics, and the combined colored races of the world will not equal them in numbers. *And, there will be no international migration.*

Prediction is hazardous, it is true. There may be catastrophic overturns bringing to naught all human calculations. But if any basis of forecast is fixed and certain, it is a forecast founded on the two fundamental human instincts. Hence, our confidence.

But if the banshee of world-conquest by colored battalions is too tenuous a wraith to disturb one's sleep, there is another which is at least worthy of discussion. It, too, may turn out to be more or less imaginary; at the same time there is a possibility of its growing into a real Frankenstein's monster. I refer to the results of intercrossing among the primary races.

The rapid progress in the experimental study of heredity makes it possible to treat this subject with a precision which was unknown some 20 years ago. Really to appreciate the status of the question, however, a technical background of genetics is essential, and since only a shadow of this background has been given, the reader must take some of the statements on trust.

Though direct evidence on the origin of the great subdivisions of the human race is lacking, one can reconstruct the most interesting features of the event without drawing on a romantic imagination. Even in the earliest days there must have been migration from the cradle-land of human development. Families, clans, or tribes ventured forth into new regions, found them to their liking, and settled down. In these various situations, under different suns, wrestling with the difficulties peculiar to the district, each increased and multiplied. During periods of time to which the "Years of our Lord" seem as but a day, variations in physical type and structure, in co-ordination and organization, appeared in such numbers, that, under the hand of Natural Selection which acts so stringently where mind cannot foresee and interfere, distinct races were built up, each fitted for life under the particular conditions it encountered.

Within historical times isolation became less and less a factor in human evolution—hybridization became more and more in evidence. Thus many of the nations of to-day are mixtures of relatively distinct types, complex hybrids in which there is little uniformity. At the same time three primary race-stocks still survive in more or less purity, called for convenience the white, the yellow, and the black.

No one denies that these types are decidedly unlike in physical appearance, that they differ in numerous well-defined hereditary characters. Similarly, no student of heredity would deny that these stocks differ through heredity in that complex equipment which makes for mentality. But, it must be admitted, cogent proof of this fact could not be cited until recently. To-day psychological and genetical tests place the matter beyond doubt as far as the white race and the black race are concerned. Adequate comparative studies have not been made between members of the yellow race and members of the other two. Even if this comparison had been made between the yellow and the white races, however, it probably would have been unsatisfactory in deciding the point at issue. Circumstantial evidence makes it seem likely that the two stocks are relatively equal in intelligence, but that they differ qualitatively.

The psychological tests thus far provided bring out more strikingly the quantitative differences.

Genetic students will agree in their opinions as to what must happen in crosses between compatible types differing thus markedly in their hereditary make-up. The first cross will be intermediate between the characters of the parents, though in some few details the progeny may seem to resemble one progenitor more than the other. The individuals will be rather vigorous physical specimens, maturing rapidly and exhibiting great fecundity. Succeeding generations will *tend* to combine all the hereditary units by which the original parents differed, in every possible recombination. The descendants will show variability, therefore, and will present the possibility of selecting numerous types. But since the original races differed so materially, and since there can be no omniscient selection of the best, the result will be a somewhat variable blend persisting until the agencies of natural selection active under the special circumstances turn it into the various channels of possibilities lying open to it. In other words, though the variability opened up by primary race crosses is so great that if an all-knowing ruler were permitted to select and mate at will a better type might be evolved; in the slow-going, stumbling world of reality in which we live, it would be the height of folly to recommend it. The machinery of the two organisms has been smoothed into an easy-running whole by the very fact of survival during the last half a million years. He is a bold tinker who wishes to try his hand at exchanging parts. The stock-breeder will need no argument to support this contention. He would like to produce a better breed of milch cows. He knows what he wants. He can select as stringently as he desires. He realizes the possibilities in hybridization. Nevertheless, he laughs down the man who suggests hybridizing the Jersey with the Hereford. His knowledge of heredity makes him appreciate the difficulties in the way.

The question put to the geneticist was this: "Given two stocks of the human race widely differentiated,[1] but with equivalent hereditary endowments, do you advise intermarriage?" He replied: "Do not risk it; it is dangerous ground." If this be true when the races are relatively equal in innate qualities, how much more emphasis can be put into the reply if it can be shown that one is far superior to the other.

About the middle of the nineteenth century, when men began to busy themselves inquiring into the cultural history of mankind, when, in a word, anthropology in its many branches was rising to a status of some dignity, speculation grew rife as to whether there were, in truth, inherent differences in the mental make-up of individuals or of races.

The intellectual leaders of one school were John Stuart Mill and T. H. Buckle, and their influence was great. They professed an unswerving belief in the unlimited power of education. They accepted without reservation the political aphorism of our colonial forefathers: "All men are created free and equal." And, to give them their due, they succeeded in bringing the greater part of the civilized world to profess a similar belief. I say "profess" designedly, because I believe that deep down in their secret mind, these people do not believe the doctrine at all. The egocentric impulse is too great. But, as a matter of actual record, our modern democratic political and educational systems have been founded and carried on with this outward confession of faith, and socialists one and all have taught it as the true religion.

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[1] Note that crosses between the primary races are what is emphasized here. Paradoxical as it may seem to the reader, intercrossing between rather *closely* related race-stocks, followed by those periods of more or less intensive inbreeding which are inevitable because of society's stratification, has promoted race progress. It is thus that the English, the French, the German, and many other nations have been built up.

There is a good genetic basis for this peculiar situation. The stock-breeder makes his advances by crossing together strains that are different, yet are not too greatly differentiated. This gives him a high degree of variability from which to make his selections. He dare not make crosses between strains that are too far apart genetically; because the chaotic variation thus produced gives him little hope of a successful selection.

Furthermore, even the narrow race crosses which have given such opportunities for genius to be produced in the human race have not been without their disadvantages. The variability which permits the recombinations that make for superior ability carries inferiority at the other end of the scale. This matter is referred to again in Chapter X, and is elaborated more fully in a book entitled *Inbreeding and Outbreeding; Their Genetic and Sociological Significance*, written by the present author in collaboration with Doctor D. F. Jones.

The leader, or rather the first extremist, of the other school was Le Compte de Gobineau, whose belief is expressed in the title of his chief work, *L'inégalité des races humaines.* He frankly announced, as MacDougall quotes, "I have become convinced that everything in the way of human creation, science, art, civilization, all that is great and noble and fruitful on earth, points to a single source, is sprung from one and the same root, belongs only to one family, the various branches of which have dominated every civilized region of the world." Then he lets us into the secret. This was his family, his race, the Teutonic race.

Says MacDougall:[1] "Gobineau's race-theory chimed so well with the political aspirations of the leaders of Germany that, with appropriate modification to the effect that modern Germans are the purest representatives of the super-race, it became the official doctrine of the country. German anthropologists busied themselves to discover evidence in its support. H. S. Chamberlain, popularly known as the Kaiser's favorite anthropologist, gave it its most complete expression in his *Foundations of the Nineteenth Century*, a book which greatly influenced the Germans from Wilhelm II downward."

To-day we have Madison Grant and De Lapouge, representing this school in a more moderate form, defending innate racial superiority in the Nordics. The modern representatives of Mill and Buckle who deny all value to heredity are Finot and Oakesmith, and a host of lesser lights. The one group MacDougall very neatly designates the "race-dogmatists," the other the "race-slumpers." Both schools have proposed ludicrous theories and have endeavored to support them by all manner of special pleading filled with bombast and extravagance and notably wanting as to fact. Each says the other's arguments are nonsense, and in this one point, at least, the unprejudiced seeker after truth unmoved either by race pride or by sentimentalism may be inclined to agree.

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[1] *Cf.* MacDougall, *l. c.*

The reason is not far to seek. Out of the dozen or so men who in the public eye are the leaders of each school, not a single one exhibits a working knowledge of the discovered facts regarding variation and heredity, the very subjects upon which they undertake to generalize. In earlier days absence of critical evidence might be deemed a valid excuse for utilizing available historical facts which could often be interpreted in diametrically opposite ways, although one is surprised that more interest was not taken in gathering pertinent data and less in trying to interpret superficial scattered observations. To-day even this excuse cannot be offered. Scores of well-trained observers in physical anthropology, psychology, and genetics have been quietly at work collecting precise evidence on these matters. Voluminous data exist which go far toward an ultimate decision of the whole question.

It will be impossible to present the results of their investigations in detail in this volume, thus showing just how far one may carry his conclusions or wherein lies the unexplored ground. It is possible, however, to give such main results as bear upon the primary race hybridization problem met in the western hemisphere in a very few words.

First, anthropologists have discarded the political grouping and the language grouping of mankind as a basis of study. They have gone into quantitative measurements of physical differences. These researches have forced them to conclude (1) that an enormous degree of differentiation has appeared in the human race; (2) that these differences are relatively permanent and uninfluenced by external conditions; (3) that by tracing these differences varying degrees of complexity in hereditary transmission are indicated, and (4) that unsuspected hybridization can be shown on some parts of the earth's surface and unsuspected purity of type on other parts.

Second, psychologists have discovered a relatively efficient means of testing innate mental ability which is not markedly influenced by education. These tests are statistically valid in groups to a remarkable degree; that is to say, they may deceive in the individual case, but the association is high enough to give a close approximation of the truth when sufficient numbers are used. The results of the tests show an extraordinary inherent difference among individuals and a great average difference between certain races.

Third, geneticists have discovered that one generalized type of heredity mechanism controls inheritance in all sexually reproducing plants and animals. In man himself, they have proved definitely that numerous physical peculiarities, and mental abnormalities like certain kinds of insanity and feeble-mindedness, do in fact follow the mechanism of inheritance demonstrable more conclusively on the lower organisms. They have shown that normal differences in innate mentality exhibit no deviations from this law, and therefore may be assumed *a priori* to be inherited in the same manner as physical characteristics of the same order of complexity.

Thus anthropological data, psychological data, and genetical data fit together like the parts of a picture-puzzle. In each line taken separately there is proof of wide variaability within the race, and of different levels between races. Taken together, the proof is overwhelming. A biological basis for the race dogmatist's position is unquestionable, therefore; where he and the biologist part company is when they begin to draw conclusions. The one forbids racial crossing because of an indefensible belief in the general superiority of all the individuals of one race over all the individuals of another; the other advises against racial crossing even between widely separated races of equivalent capacity simply because the operation of the heredity mechanism holds out only a negligible prospect of good results against a high probability of bad results through disturbing the balanced whole of each component. Both recognize differences in racial levels or averages, but the biologist realizes what an immense amount of overlapping there is. He sees how small is the gap between the efficiency levels of each race as a whole, and how great is the chasm between the superior and inferior extremes within the race, even though each race may have exclusive possession of certain hereditary units. The race dogmatist takes an immoderate *personal* pride in the accomplishment of other individuals of the race to which he belongs. The biologist has no such misconception. He places a high value on good breeding because he knows this improves the chances of each member of the stock receiving high endowments, but he does not fail to appreciate the number of instances where brilliant fathers begat stupid sons. He knows the great difficulty both in establishing and in maintaining anything like an aristocracy of brains, and that even when one comes from a generally superior family, he must stand on his own merits. One cannot climb up on the monumental achievements of his ancestors and look down on the man of humble birth, for that man, though the son of average parents, may have received a happy combination of hereditary factors much superior to one's own.

With this somewhat meagre outline of the premises, let us see what sort of a primary race problem exists in the United States. I am not thinking now of this problem as usually delimited and on which many tons of literature have already been scattered abroad. At least I cannot feel that the real race problem and the politico-social problem usually discussed are one and the same. There have been so many secondary race problems of the latter type, such as those between Magyar, Slav, and Teuton, between Jew and Gentile, and so many tertiary problems, such as those intraracial struggles based on temporary economic or religious conditions, that one feels there may be in the one case mere expediency, in the other something deeper.

Mecklin[1] may be correct, however, when he puts even the social color-line on a genetic basis. He does society the honor of basing its attitude on the following logic:

> When society permits the free social intercourse of two young persons of similar training and interests, it tacitly gives its consent to the possible legitimate results of such relations, namely, marriage. But marriage is not a matter that concerns the contracting parties alone; it is social in its origin and from society come its sanctions. It is society's legitimatized method for the perpetuation of the race in the larger and inclusive sense of a continuous racial type which shall be the bearer of a continuous and progressive civilization.

This is of course a proper position to take; but, as Popenoe and Johnson[2] point out, the social mind often assumes its attitude of superiority simply because another race is *different*. If the existent differences are those of tradition and social custom only, it is scarcely justified; if they are innate biological differences, it is another matter. And the situation which actually confronts us is this: the negro race as a whole is possessed of undesirable transmissible qualities both physical and mental, which seem to justify not only a line but a wide gulf to be fixed permanently between it and the white race.

There is a real inferiority in resistance to certain diseases. The negro has been subjected to selection for malaria, yellow fever, hookworm, and elephantiasis in his original home.

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[1] Mecklin, J. M., *Democracy and Race Friction: A Study in Social Ethics.* N. Y., 1914.

[2] Popenoe, P., and Johnson, R. H., *Applied Eugenics.* N. Y.: Macmillan, 1918.

To them he has developed a comparative immunity much greater than the white man. But fortunately these diseases are capable of being controlled completely. They are all due to animal parasites which can be exterminated with little difficulty. This is not true of the great scourge of the negro race, tuberculosis, to which the white man in his turn has become relatively resistant: it may be rooted out at some later date, but to-day it can hardly be said to be controllable. Nevertheless, these are minor matters. It is on the psychological side that one must look if one is to find a firm foundation for the conclusions drawn, and on this side there are material data from the examinations of the men drafted during the late war.

Our army recruits, after passing successfully on a physical basis, were tested by examinations especially designed to grade inherent ability without giving advantage to the educated man because of his education. These examinations formed the greatest psychological investigation ever conducted, and they yielded results which are extremely useful. They are not perfect by any means, but as a measure of mental capacity they compare favorably with the average school examination designed for measuring knowledge in a given subject. It must be confessed that I for one hesitated in coming to a judgment on their validity until I had had an opportunity of examining the complete report on them published as a memoir of the National Academy of Sciences.[1] There is in this report ample evidence to convert the sceptic to the belief that they give a picture of innate ability which is statistically valid, when averages only are considered. The various examinations checked so well among themselves, and the ratings agreed so generally with the military records, that no other conclusion is possible.

At the same time, I would not lead the reader to believe, as various journalists have done recently, that these tests form a means of exposing individual ability so that it can be measured with an exact yardstick. The nomenclature used, the so-called mental age, is much to be deplored, since it is likely to lead the layman astray. One must realize, for example, when considering the statement that a given percentage of the people have "mental age thirteen," what a large proportion of the capacity of any individual has already been developed by the time he or she has reached this age, and what an artificial standard it is anyway. These examinations do not go further than to show the average "spread" of mentality, when this spread is exhibited in arbitrary man-made categories; but even with this limitation, they are of very great value.

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[1] Yerkes, R. M., ed., "Psychological Examining in the United States Army," *Mem. Nat. Acad. Sci.*, vol. 15, 1921.

A very large number of individuals were given various tests, and were rated on a letter-scale running from the very superior, rated A, to the very inferior who had not sufficient mentality to become satisfactory common soldiers, rated D –. A random sample of these examinations geographically representative follows:

Race	Number of cases	Percentage making grade						
		A	B	C +	C	C –	D	D –
Whites— Groups I, II, IV.....	93,973	4.1	8.0	15.0	25.0	25.8	17.1	7.0
Negroes— Group IV...........	18,891	0.1	0.6	2.0	5.7	12.9	29.7	49.0

Some of the examinations undoubtedly placed the negroes at a slight disadvantage, but since others were advantageous to them, the table makes out a very good case for white superiority. And the results are corroborated in other ways. For example, 45.6 per cent of a large sample of negroes from Northern States rated D or D –, while 86.2 per cent of a sample of similar size from the Southern States obtained this low rating. Thus, after making large corrections for possible unfair application of the tests, the ambition and relative intelligence which has made so many negroes migrate to the North is measured quantitatively. Again, the experiment was tried at Camp Lee of separating the negroes on a color basis into two classes. "The lighter class contained those whose color indicated that they were true mulattoes or persons of a larger proportion of white blood than true mulattoes. The darker class contained pure negroes and those whose skin color indicated that they had a smaller proportion of white blood than true mulattoes." In one of the tests (alpha), the lighter negroes obtained a median score of 50, while those of darker hue fell to 30. In another test (beta), the lighter class had a median score of 36 as compared with a median score of 29 for the darker class.

When a complete analysis of the racial data obtained by the army tests is finally made it will be sufficiently voluminous to convince the most pronounced sceptic, if the samples now published are representative. To-day one must rely somewhat on other evidence. It exists in considerable quantity.

B. A. Phillips[1] found the percentage of retardation in the elementary colored schools of Philadelphia to vary from 58.2 per cent to 72.8 per cent, while the average retardation in all schools was 40.3 per cent. This is a decided difference when it is realized what a high percentage of the Philadelphia colored population is not pure negro. Phillips also found a general difference of 28 per cent in favor of white pupils when he compared white and colored children of the same age and of similar home environments.

Similar conclusions have been drawn by several other investigators, but perhaps the most precise tests have been made by G. O. Ferguson, Jr.,[2] on about 500 Virginian children of each race. His work is especially interesting because he endeavored to determine the amount of white blood present by inquiry and by skin color, and thus obtained data supporting the belief that the ability of a colored man rises in direct proportion to the white blood he has received. Ferguson concludes that "the intellectual performance of the general colored population is approximately 75 per cent as efficient as that of the whites," and that pure negroes have less than 60 per cent of white intellectual efficiency.

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[1] Phillips, B. A., "Retardation in the Elementary Schools of Philadelphia," *Psych. Clinic*, 6 :79–90, 1915. "The Binet Tests Applied to Colored Children," *ibid.*, 8 :190–196, 1917.

[2] *Cf.* Popenoe and Johnson, *op. cit.*, p. 288.

Pyle[1] found negroes to rank less than half as high as whites in substitution, in controlled association, and in Ebbinghaus tests, which are designed to examine some of the higher mental functions.

In this connection it may be well to remark that several investigators have found no appreciable differences between the races in motor capacities and such sense capacities as perception and discrimination. Equality in these traits has been used by several "race-slumpers" as evidence of equality in every capacity. The obvious reply is that the dog ranks higher than either race in some of these functions.

Would there were more data on the subject, but as it stands it makes one feel inclined to see significance in Pearson's[2] anthropological measurements from which he concludes there is "a continuous relationship from the European skull, through prehistoric European, prehistoric Egyptian, Congo-Gaboon Negroes to Zulus and Kaffirs." He finds an indication "of a long differentiated evolution, in which the negro lies nearer to the common stem than the European; he is nearer to the childhood of man." It makes one pay attention to the circumstantial evidence of history which gives no indication that the race is able to rise. It has never risen above savagery in Africa. In Hayti it has sunk to its original depth even after its contact with French culture. Wherever the negro has been placed he has failed, failed miserably and utterly by the white man's standards.

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[1] Pyle, W. H., "The Mind of the Negro Child," *School and Society*, 1: 357–360, 1912.

[2] Pearson, K., *Social Problems*. Cam.: U. P., 1912, p. 8.

These facts, taken as a whole, are the cold facts from which a real color peril takes form.

The negro population, including all those having discernible black blood, was about 10.5 millions in 1920. In the preceding decade it has increased only 6.5 per cent, if the census figures are correct. Between 1900 and 1910 the increase was 11.2 per cent, and in every previous decade for the last century was still higher, reaching a maximum of 37.5 per cent in the first decade of the nineteenth century.

COMPARATIVE GROWTH OF NEGRO AND WHITE POPULATIONS IN CONTINENTAL UNITED STATES

Figures in millions, adjusted in 1870 and 1890 by taking the geometric mean of contiguous censuses

Date of census	Population		Increase in decade		Per cent increase	
	White	Negro	White	Negro	White	Negro
1790	3.17	.76				
1800	4.31	1.00	1.14	.24	36.0	32.3
1810	5.86	1.38	1.55	.38	36.0	37.5
1820	7.87	1.77	2.00	.39	34.3	28.6
1830	10.54	2.33	2.67	.56	34.1	31.4
1840	14.20	2.87	3.66	.54	34.7	23.4
1850	19.55	3.64	5.35	.77	37.7	26.6
1860	27.00	4.44	7.45	.80	38.1	22.1
1870	34.30	5.41	7.30	.97	27.0	21.7
1880	43.57	6.58	9.27	1.17	27.0	21.7
1890	54.13	7.70	10.56	1.12	24.2	17.0
1900	67.25	8.83	13.12	1.13	24.2	14.7
1910	81.73	9.83	14.48	1.00	21.5	11.2
1920	94.82	10.46	13.09	.63	16.0	6.5

The diminishing rate of increase of the Afro-American is not a particularly significant fact, since the white race is showing the same tendency. If the accompanying table is examined, however, it is found that the rate by which this increase is diminishing is decidedly greater in our dusky-hued contemporaries. On their face, these figures seem to indicate a very rapid supplanting of blacks by whites, a fast mounting percentage of whites in the total population. But one is certain to be misled if he accepts the raw figures unaccompanied by a logical analysis.

Unfortunately, to make a precise study of the vital statistics of either race is impossible. Only during the last few years have the births and deaths been registered in any very considerable portion of the United States, and even to-day the figures are not as reliable as one would like. The census enumerations have also been changed at various times, so that even for the census years mixed bloods are not segregated uniformly, and birth and death records leave much to be desired. We shall have to get at the matter as best we can.

The white race has increased by immigration; such increase in the black race has been negligible for nearly a century. The recent reports for population increase taken as a whole are as follows: In 1915, with a registration area including about a third of the population, the crude birth-rate was announced as 24.9 and the crude death-rate as 14.0, leaving a yearly natural increase of 10.9 per thousand. In 1917, when 53 per cent of the population was under registration, the crude birth-rate was 24.6 and the crude death-rate 14.1 per thousand annually. By 1919, the year covered by the fifth annual report on birth statistics, the crude birth-rate was 22.3 and the crude death-rate 13.0 per thousand, leaving a natural increase of 9.3 per thousand for that year. These figures represent the facts but roughly since the deficiency of birth registration is generally greater than that for death registration, and one is probably more nearly accurate if he assumes that the rate of natural increase for the whole population of the United States in the decade 1910–1920 was somewhere between 11.0 and 11.5 per thousand. The negro increase, on the other hand, is placed by the census officials at 11.2 per cent for the first decade of the twentieth century and 6.5 per cent for the second decade. Tested statistically in various ways the last figures seem too low, but since they are all we have, we must let them stand. What they appear to show is a very slight margin in favor of white increase in the first decade of the century, and a margin of somewhere near 3 per thousand annually to-day. From all I can learn, venereal checks to birth-rate among the negroes are being supplemented to-day, even as in the white race, by contraceptive measures. And this is not so strange as it might seem, since their progenitors have carried on various practices of this kind since time immemorial in Central Africa. The result has been a greatly decreased birth-rate, which when taken in conjunction with the continued maintenance of a higher death-rate than the white race has made a marked difference in the relative rate of increase.

It would be somewhat hasty, however, to make radical predictions for the future on this basis. We have taken on ourselves the task of preventing lethal selection among the negroes in two ways: educational advantages are being offered, which will teach the brainier portion of the race to take care of itself better; and federal, state, and unofficial agencies are pushing enforcement of public-health measures. For a part of the race, the generally better conditions, which will thus be brought about, will result in a relatively lower birth-rate which one may assume will be somewhat on a par with the reduction of the birth-rate now occurring in the white race. In addition, white public-health measures will reduce the negro death-rate in spite of themselves to a degree they could not hope for by themselves. Without wishing to carry this reasoning too far, the possibility remains that the races will again approach a more nearly equal rate of increase.

But one cannot be at all certain on this score. The rapid urbanization of the negro within the past few years has been a very bad thing for the race. The vital statistics between 1915 and 1919 show many more deaths than births in the Northern States. Only in the South is the negro increasing, and even there the rate of increase is becoming so much slower than it was formerly that it is a matter of surprise to every statistician. Between 1910 and 1920 the number of white children under five years of age increased by over a million, while the number of negro children of the same age interval decreased by nearly 120,000. And although at every census between 1850 and 1910 the number of negro children to every 1,000 negro women of child-bearing age had exceeded the ratio for white women by from 40 to 170 per 1,000 women, in 1920 the ratio of children to white women exceeded that of children to negro women by 42 per 1,000.

Consideration of all the facts, therefore, leads us to look more lightly on the negro-white problem as it has hitherto been presented to us. The *real problem* is the problem of the mulatto and his descendants.

Many readers are likely to question this last statement. They will regard it as a pessimistic reflection with no foundation. Perhaps this is true, but my own personal feeling is that if the offspring of these racial crosses had, like the mule, no hope of posterity, there would be no real race problem. The negro race could not compete with the white race. With the growing economic pressure it would simply fade away as a fog before the sun. But a condition confronts us, not a theory.

The per cent of mulattoes among the colored population was reported in 1850 as 11.2, in 1860 as 13.2, in 1870 as 12.0. With a different form of question, the per cent in 1890 was 15.2. The results from this census being unsatisfactory, the question was omitted entirely in 1900. In 1910, with questions more like those of the earlier censuses, the per cent was 20.9. Leaving out of consideration the supposedly erroneous returns of 1890, one may say that the element of the negro population containing discernible white blood has increased from about 12 per cent in 1870, the first enumeration after emancipation, to nearly 21 per cent in 1910. Roughly, there were 600,000 mulattoes in 1870, 2,000,000 in 1910.

Now unfortunately there are no statistics to guide us aright in determining the comparative net fertility of these two classes of the negro population. The only observations of which I am aware are some unpublished data gathered by the eminent anatomist of the University of Virginia, Doctor H. E. Jordan, who has found the mulatto to have a greater capability of bearing children and a greater net fertility owing to his ability to care for them. And this is only common sense. With white blood comes greater intelligence and a lower death-rate. It would not be an improbable thing, therefore, to find the mulatto numerically superior to the pure black in another 30 years. It may be that even now the main increase of the colored population is from this source, the pure negro increasing very slowly, if at all.

This is not such an anomalous situation as it may seem to those who are aware that in a homogeneous population the people of lowest economic status invariably outbreed those on higher rounds of the ladder. In a sense the mulatto and the negro do not form a homogeneous population. There is a very high degree of sexual selection among the mulattoes. They intermarry much more frequently than they marry pure blacks. They tend to form a caste system among themselves. Thus the final result is to bring about an economic struggle between two types of decidedly different mental capacities, which, as in the case of white and black or white and red, leads to the survival of the most capable.

The critic will say at once: If this line of reasoning is correct, the superior white race will supplant the mulattoes.

Undoubtedly this would be true if the races competed with each other as more or less distinct entities. The danger is the origin of a more or less homogeneous mixed race. Let us draw the worst picture possible. There are to-day over 2,000,000 mulattoes who are marrying whites or mulattoes by choice and negroes on compulsion. They gradually supplant the blacks. Segregation and recombination of the traits of the two races occur. Numerous individuals appear in which negro blood cannot be detected. Their economic status advances. The color-line begins to break in places.

What is the result? Is it not a second India?

I do not wish to be accused of drawing on the imagination, picturing a dusky-hued America when there is little evidence that such an event can come about. True, as I said earlier, this may be another phantom like the bogie of world-conquest by the colored peoples. The net birth-rate of the mulattoes may not keep pace with that of the whites. Various things may happen to make for a pure Caucasian survival. But there are many more facts to give the suggestion body than can be called up to support the color peril in its older form. These are facts: actual increase in mixed bloods at a greater rate than blacks, greater ability of mixed bloods, selective mating, difficulty of continuing caste lines because of recombination of racial traits in mixed-blood matings, additional miscegenation. They must give us pause or we are optimists indeed.

Many persons fail to appreciate fully the last factor in the situation. Some believe present-day miscegenation is negligible. Others point out the undeniable fact that a large proportion of these original race-hybrids are the illegitimate offspring of negro mothers. The negro race is thus raised in intellectual capacity, they say, without decreasing the birth-rate of the white race. Without commenting on the undesirability of this procedure from the standpoint of social ethics, there is another argument of great weight: *Survival of the sons of Japheth is not promoted* *by furthering the advance of a more virile colored race of higher mental capacity which at the same time public opinion professes to wish to keep distinct.* And the laws of heredity, aiding as they do the production of variant individuals which at one end of the distribution are visually indistinguishable from those of pure white ancestry, only seem to emphasize the point.

Another factor in this situation is the successful effort of the National Association for the Advancement of Colored People to block legislation preventing mixed marriages in the 30 per cent or so of our States having no laws against it. Their argument follows the pernicious teaching of William Lloyd Garrison to the effect that the state has no interests or rights when it comes to limiting marriage relations. They support their plea with a superficially plausible sentimentality by asking to have no laws leaving the colored girl powerless to compel a white seducer to marry. By this stand they gain the support of puritanical busybodies like the well-meaning lady mentioned by Goddard who compelled the feeble-minded girl to marry the imbecile father of her child, and thus succeeded in bestowing five more feeble-minded children on the world.

I shall not argue the question, but shall rest with a quotation from a profound and temperate student of the race problem, Mr. A. H. Stone,[1] who obtained the following statistics from the Registry of Marriages in the city of Boston:

> During the five years from 1900 to 1904 there were 143 marriages between negroes and whites in the city of Boston, and 907 in which both parties were negroes. In other words, with a negro population of 11,591 there were 1,050 marriages. Of these, 143, or 13.6 per cent, if my calculation is correct, married white persons. Of these mixed marriages, 133 were cases of white women marrying negro men, while only 10 white men married negro women. With the white woman in this instance rep-

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[1] Stone, A. H., *Studies in the American Race Problem.* N. Y.: Doubleday, Page, 1908.

resenting 93 per cent of her race's participation in such alliances, it is not safe to dogmatize as to the processes of race intermixture. And all of my investigations thus far lead me to believe that the same conditions exist in Chicago, Philadelphia, and New York.

A word in conclusion. The sons of Japheth not being particularly meek, presumably did not inherit the earth; nevertheless, by unrolling the napkin and industriously using their talents they have gradually become possessed of the fatter portions thereof. They have pushed out and subdued the wilderness, they have brought the forces of Nature to obey command. They have increased and multiplied, they have prospered beyond belief. Thus, they are in a seemingly impregnable position. With the lion's share of natural resources at their disposal, with the innate capacity which has made them what they are, no material force stands in their way.

Looking to the north, the east, the west, the horizon is unclouded. Only in the south appears a little cloud no larger than a man's hand. It may be a passing mist, but it bears watching. From the Mason and Dixon's line to the Horn, from Gibraltar to the Cape of Good Hope, the southland outpost is the post of danger. This is the direction in which to double the guard.

We have our own danger in its particular form. In Africa our clan meets it again. South of the Rio Grande it is somewhat changed, but similar in type. The outcome of it all no one knows.

CHAPTER VI

PERMANENT AGRICULTURE, POPULATION RESTRICTION, AND NATIONAL PROGRESS

The United States is in the midst of its second century. The little fringe of settlements along the Atlantic seaboard, counting only 3 million souls, has pushed the course of its empire to the Pacific. Within its limits there are 107 million people. The land has been spanned by a network of railroads. Cities have appeared as if by magic. Industry has expanded by leaps and bounds. Wealth has been at hand for the taking by any resolute character with the courage of his convictions. Comparatively speaking, economic stress has been absent. With the exception of those four regrettable years of Civil War, its existence has been singularly calm and happy.

No other nation ever had this record, and for two good and sufficient reasons no future nation can repeat it. The experience was unique in time. Its inception was coincident with the beginning of industrial expansion; thus it rose with the rise of the age of steel. The physical advantages, also, were incomparable. It was formed from the sole remaining great block of unmanned territory in the climatic zone of high initiative, where accomplishment is easy and returns are large. Both agriculturally and metallurgically its greatness was predetermined—in so far as it is possible for natural riches to make for greatness.

The presence of worthy leaders goes without saying, for progressive national development does not come without the aid of constructive minds and aggressive personalities, no matter what the advantages in the way of material resources. Certainly it is without intentional disrespect to these leaders that special attention is called to the magnificent capital assets with which they started business. The reason for stressing these possessions is because one and all we have been in the habit of accepting too much personal credit for our country's position in world affairs. We commonly admit that as a whole we are a rather competent lot. But are we, after all, quite so masterful as we like to assume? What are a hundred and fifty years? Merely a few clock-ticks on the time-piece of history.

Is it a wholly unnecessary or foolish query to ask whether we have founded our house upon the rock or upon the sand? I have often thought that the most thoroughgoing definition of a high civilization is "the power to build most firmly for the future." Have we, then, given evidence of a high civilization; or have we been just a lot of children happily taking the good things Mother Nature has handed out, without the slightest attempt at preparation for the time when we come of age and have to struggle for ourselves?

Perhaps it is unwise to try to answer these questions too precisely. The house in which we run this big business of ours probably has a groundwork neither of adamant nor of quicksand. More likely the underpinning is of fair average quality and, with a little patching now and then, will stand for some considerable time. But how about the profit-and-loss account? As a nation of business men we certainly ought to insist on an occasional inventory, a cost record, a balance-sheet. In a word, we ought to know just where we stand nationally as well as individually.

The United States is so well stocked with the raw materials of mechanical industry there need be no worry on that score at present.[1] When questioned as to the supply of each commodity she can copy the reply of the merchant of the *Arabian Nights:* "I have abundance." During the late war, a detailed survey of resources showed the country to be lacking in scarcely anything, except two or three of the rarer metals. The supply of the main essentials of an industrial civilization was such as to make aliens burst with envy. To be sure, a few plant products, rubber and certain drugs, were not forthcoming at the time; but the variety of soils and of climatic conditions makes it possible to produce each and all when needed.

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[1] The rate at which the metals are being used is nevertheless causing much concern among engineers. It is variously estimated at from three to five times the rate of population growth.

In stored energy, also, the country has been blessed beyond measure. The world's coal reserves, actual and potential, amount to about 7,000,000 millions of tons—a comforting fact to think about early on a February morning. An estimate by the Geological Survey gives the United States just about half this supply—something over 3,000,000 millions of tons. The annual production, including the slate and stone one pays for, is in the neighborhood of 500 million tons. At this per capita rate, the anthracite will last only a few decades more and the high-grade bituminous will go in about 500 years, but the reserve of low-grade coal ought to provide for reasonable wants for another 1,000 years at least. The rest of the world is more thrifty, or more sleepy if you wish; at the current rate of mining the known supplies will last nearly 7,000 winters.

Then there is oil. Mr. Hearne, writing in *The Sphere,*[1] believes oil to be so plentiful that it will ultimately displace coal—at any rate for a time. He promises more and more discoveries of petroleum, and judging from the known distribution of oil-shales, he may be correct. But the difficulty of making predictions in the case of oil is great, because the reserves cannot be estimated with any great degree of precision even when the distribution is known. The United States, with an annual production of between 300 millions and 400 millions of barrels, rather swamps the production of the rest of the world; but we are using it as fast as we get it, and even to-day are feverishly hunting for further supplies. It is also noticeable that more and more capital is going into the industry in proportion to the results obtained. In other words, decreasing returns are even now visible on the horizon.

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[1] 1921.

The time when the coal-bins will be empty and the pipelines dry is far removed; nevertheless, even then we are by no means at the end of our course. The power to be developed from flowing water is considerable, and it may be possible ultimately to harness the tides, though engineers are inclined to shrug their shoulders at the prospect. Still more promising in their estimation is the possibility of utilizing the heat from the cooling globe beneath our feet. Men eminent in the profession deem such a project feasible, though just what will be encountered in the endeavor, and just what will be found should the technical difficulties be surmounted, is wholly an unknown quantity.

Because the workshop riches stored in the earth's crust are plentiful in this country is no excuse for pouring them into a sieve; wastefulness is never a virtue. They have been mentioned first, however, for a particular reason. Conservation has been preached very fervently by several of our assiduous publicists, and it is noteworthy that they usually expend their energies solely upon this type of natural wealth. Forestry is the only agricultural specialty included in their exhortations; but, as we shall see, it is agriculture rather than mechanical industry that is in need of these evangelists to-day.

In order to bring out this point clearly, it will be necessary to treat at some length the agricultural requirements of our present and our prospective populations.

The census has been taken fourteen times at the decade periods ending in zero. The population when enumeration began in 1790 was less than 4 millions; that in 1920 was nearly 106 millions. This tremendous expansion has been the result in part of a high excess of births over deaths, and in part of an immigration which between 1820 and 1920 amounted to over 32 millions.

It is evident from such figures that certain restrictive factors ordinarily effective in the older countries have been very limited in their operations here. If one compares this increase with that of northern Europe, for example, one of these factors stands out very noticeably. Northern Europe was already fairly well populated when the United States began her career, but was able to expand in spite of its goodly numbers because it could import food from less densely populated territories. If wars took about the same toll in each case, as presumably they did before 1914, and if the difficulties encountered in opening up a new country counterbalance some of the positive restrictions due to greater crowding in the older countries, the presence of quantities of rich agricultural land must have been one of the great accelerating agents. To gain an idea of how this worked out, all one needs to do is to examine a series of atlases published at different periods during the last century and note the course of population to the westward. Besides this, one must remember that our immigrants were physically a selected lot, in the sense that the majority had already successfully passed the hazards of childhood, and that they generally arrived at the height of their reproductive period.

But no one will deny that the time will come when restrictive factors will become more and more effective, when the United States as it now exists with territorial limitations all marked out will cease to be able to support more people with the same ease that it supports those now enlisted under the Stars and Stripes. Naturally, it will be easier to inspire sympathy with a system of immigration restriction, of eugenic reform, and of agricultural conservation if it turns out that this eventuality will probably arise sooner rather than later.

First let us examine certain conclusions put forth by Doctor Raymond Pearl, one of America's foremost biologists. Pearl[1] makes a statistical demonstration of the truth of the Malthusian law of population by showing that census enumerations in practically all countries fit the same sort of curve as does the growth of an individual organism. It may be questioned whether the curve would be as smooth and orderly if one knew the trend of populations in all times past. There was probably an upward shift when a people passed from the barbaric to the pastoral era, a second when they entered the agricultural era, and a third when they entered the industrial era. But since the existing data are available only for the past century, during which there was industrial progress but no outstanding social upheaval, they fit a single smooth homogeneous curve in a remarkable way. It first starts slowly from the horizontal, shifts more and more sharply toward the vertical, then reversing the process, again reaches the horizontal. The type is shown in Figure 5, based on the population data of the United States.

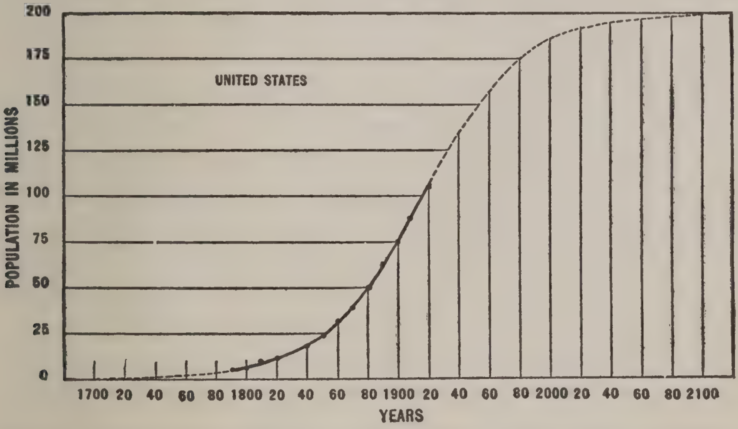

Fig. 5. CURVE OF POPULATION GROWTH IN THE UNITED STATES TOGETHER WITH ITS PROBABLE TREND. (AFTER PEARL.)

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[1] Pearl, Raymond, and Reed, L. G., "On the Rate of Growth of the Population of the United States since 1790 and Its Mathematical Representation," *Proc. Nat. Acad. Sci.*, 6 : 275–288, 1920.

This curve approximates a true biological law of population. Just as in the growth of a single organism, populations meet an excess of constructive factors for a while and their growth is accelerated; but sooner or later restrictive agents come to the fore and they tend to approach a static condition, a condition of full and finished growth. Among the census statistics of the various nations, one can find examples of all of these various stages. Australia and Canada are young, national children so to speak; the United States is an adolescent; France is an adult.

Two interesting facts emerge from an examination of the curve presented for the United States. The first is this: if the curve represents truly the trend of population in this country, the time when the point of greatest growth was passed, and the country began to show a progressively diminishing increase in population, was in 1914. Now such a result must have had a cause. I shall show presently from other data that the country entered the era of diminishing agricultural returns somewhere between 1890 and 1900. Is it not more than a coincidence that following immediately upon the heels of this occurrence we should enter the period of diminishing returns for population?

The second outstanding feature of the curve is the location of the upper limit, the point where it reaches the horizontal. This means that the prediction for the maximum population of the United States, according to this curve, is 197 millions—roughly twice its present number. The time given for this interesting event is about the year 2100; but one may assume that by 1960 or 1980, when the curve turns sharply toward the horizontal, there will be a population pressure such as we of this age and generation have never imagined, if the shift comes by natural processes of restriction rather than by forethought and design.

When casting over Pearl's conclusions in one's mind, however, one must remember what a great difference in the final results may be made by a slight shift in the current effective causes. It takes no stretch of the imagination to see such a relatively great increase in population continue that the change which portends a stationary population must come about rather suddenly. In 1920 there were 105,710,000 people in continental United States. This is an increase of 13,536,000 over the previous decade, which was by no means gained wholly by immigration. The average annual increment through excess of births over deaths is falling, but it is not falling fast. If, then, the doors should be opened for all those who are knocking, we should have just the situation we have mentioned—unduly prolonged rapid increase. In other words, Europe, overcrowded with people, bankrupted, and reduced to social chaos by war, is seeking every outlet possible. Meanwhile, natural increase in the United States is rapidly filling up the gaps. There is not the chance for economic freedom that Europeans have been led to expect. But since they are unaware of this fact, millions of them are willing to take the leap. Left alone to work their will, they would come in swamping numbers. Let us see what space may be provided for them.

Read first this editorial from the New York *Tribune* in November, 1921: "It has been computed that Texas alone, intensively cultivated, could feed every person on this planet. There is no lack of natural resources for the maintenance of life if humans were at all evenly distributed over the earth's surface, nor has it been demonstrated that any given territory is yet incapable of yielding ample sustenance to those within its borders. The desire for expansion felt by teeming peoples proceeds from surplus energy rather than from a losing struggle for existence." It is extraordinary, it is even somewhat amusing, that there should be persons without the slightest knowledge of the trend of population or the possibilities of agriculture who will write thus; but it is also serious. These false ideas in regard to agriculture are held by so many people. Not long ago I asked a well-trained business man how much more land could be brought into cultivation in the United States. His offhand estimate was between 400 and 600 per cent. This is in face of census figures showing that nearly one-half of the total land area of the country is now in farms; though only about one-half of the land on these farms is improved.

In endeavoring to take stock of our total agricultural possibilities, one can do no better than follow the excellent study of O. E. Baker and H. W. Strong appearing in the Year-book of the Department of Agriculture for 1918, entitled *Arable Land in the United States.* The question they start out to answer is about as pertinent to the present inquiry as could well be imagined. Why is it, they ask, that with a land area of 1,903 million acres, so little of it is cropped? Their answer is based on the figures for the census of 1910.

Four conditions must be met in order that land may be adapted to agricultural uses: it must not be too stony or hilly to till, it must have a sufficient rainfall for crop growth, the growing season must not fall below a certain minimum, and, finally, it must not be wholly infertile. For these reasons, besides taking out numerous little spots of a hundred thousand acres or so in various parts of the country, nearly all that great expanse of country west of the Dakotas, Kansas, and Nebraska must be withheld perpetually from intensive food production. Within this region there are some fairly considerable areas of rich arable soil where sufficient natural rainfall or systems of irrigation provide water for bumper crops; but they amount to less than 5 per cent. The remainder consists of land where the rainfall ranges from zero to 15 inches, where slopes are precipitous and elevations high, or where the soil is barren of the necessary food for growing vegetation. Of this type of land we are the proud possessors of 1,000 million acres. But there is other land where the conditions are not so hopeless. To the 30 million acres of land now under irrigation, another 30 million acres may be added if all the available sources of water are utilized. There are some 60 million acres of drainable swamps. It will mean much toil and a great capital outlay to bring these 90 million acres into production; but it can and will be done as fast as necessity sets the machinery in motion. Besides this, there are 200 million acres of forest and woodland gradually to be claimed for agriculture as food prices go up and economic pressure makes it possible to farm land earlier looked upon as waste.

Briefly, then, Baker and Strong put the situation in this way: in 1910 there were 478 million acres of improved land, 600 million acres of forest and woodland, 745 million acres of range land, 40 million acres of actual desert, and 40 million acres of cities, roads, and railways. Of the total of these items, there were 879 million acres in farms. The improved land was 319 million acres of it in crops, 25 million acres made up farmsteads, and 134 million acres were pastured or were lying fallow. The remaining 401 million acres, though occasionally used for pasture and general grazing, were too poor to be worth the labor and capital necessary for improvement under present conditions.

The probable ultimate disposition of the land is as follows: improved land, 800 million acres; forest and woodland, 360 million acres; range land and unimproved pasture, 425 million acres; desert, 238 million acres; cities, roads, and railroads, 80 million acres. This estimate, which thus accounts for our whole 1,903 million acres, makes only two slight changes from that of Baker and Strong. Additional space equal to their present area is set aside to provide for the growth of cities and railways, and 200 million acres having a negligible grazing value is added to the true desert.

Now really this is not an unlimited possibility for expansion. At that future time when the land has filled until there is standing-room only, as one might put it, there are 800 million acres of improved land available, 67 per cent more than has been improved in a little over a century and a half. It will have been possible to add to the 478 million acres in cultivation in 1910, 30 million acres of desert which engineers believe may be irrigated, 60 million acres of swamps that can be drained, 82 million acres suitable for dry farming and upland pastures, and 150 million acres of tillable land which are now in woodland and forest.

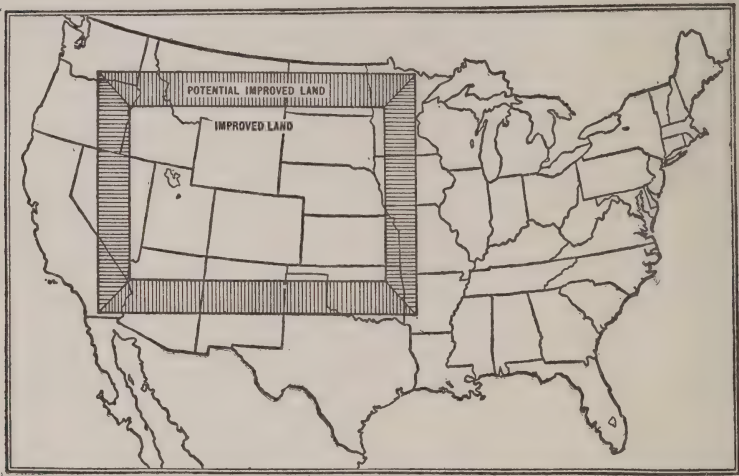

Fig. 6. RELATIVE AREA OF LAND IMPROVED IN 1920 AND OF TOTAL POTENTIAL IMPROVED LAND IN THE UNITED STATES.

If, then, it be admitted that the best land is taken first, and that presumably the 67 per cent additional is only half as good as what is now under cultivation, which to an agriculturist is a reasonable assumption, it follows that on a productivity basis, just about 35 per cent can be added to our present holdings.

Roughly speaking, 100 million people are supported comfortably now, and 135 million people can be supported eventually by the agricultural efficiency at present in sway. The obvious conclusion is that the present productivity must be increased by just 50 per cent if even the population predicted by Pearl is given the food standard of living to which the people are now accustomed.

Many will cast a distrustful eye on the 1,103 million acres, 58 per cent of the total land area of the country, which are set apart as land which must be permanently withheld from cultivation. But if these figures err, they err on the side of optimistic conservatism. They are comparable with the percentages of land the overpopulated countries of Europe, with less extensive arid regions, have been able to cultivate; and if they have to be revised at the end of a few centuries, it is more likely that they will be revised upward than downward.

In brief, 743 million acres of land are withheld because of irremediable natural conditions. They consist of arid lands having no possibility of irrigation because of lack of a water-supply, lands where the mean summer temperature is too low to grow crops, lands where the topography is such that cultivation is impossible, lands which are without natural soil fertility, and undrainable swamps.

The 360 million acres of forest and woodland must be retained for a variety of reasons. In most cases their topography prevents cultivation, so that they could not be used for farm lands even if no other obstacles intervened. But beyond this fact stands the need of wood. France retains 25 per cent of her area in forest and still finds it necessary to import lumber, and in Germany the proportion of wooded territory is even greater. Thus the proposal that the United States keep 19 per cent of her land in forest is conservative to the point of imprudence. Furthermore, it is the opinion of many meteorologists that if this figure be cut, a change in the rainfall and the temperature of the improved land would ensue such as to reduce its productivity much beyond that of any increased production resulting from the additional new lands.

Let us assume the rôle of the cheerful optimist for the moment, however, and calculate the maximum number of people it is humanly possible for this land to support if we keep up a reasonable standard of living, if we follow rather closely our present food habits, if we conserve carefully our soil fertility, and above all if we farm as intensively, as scientifically, and with as little waste as the best farmers of Europe who have been under the necessity of perfecting their agriculture because of population pressure during the past half-century. The grazing-lands might take care of 4 millions allowing one person to each hundred acres. The forest and woodland could do a little better. With proper grazing, a little tilling here and there, the use of forest trees having fruits with some food value where possible, and the utilization of sawdust after chemical treatment to supplement the rations of the domestic animals, it might be possible to support one person for each 50 acres, a total of 7 millions. Then if we use our old figure of 2.5 acres per person as the prospective continuous food power of the cultivated land, the 800 million arable acres will support 320 million people, and we shall have 331 million people, all told.

These figures may perhaps be taken as the maximum possibilities which lie before us, but practically they mean little. Suppose one assumes that the reserve land, the 67 per cent, is every whit as good as that now under cultivation. By our present standards of farming the country will support only 166 million people. *To feed 331 million mouths, it will be necessary to double the present production on every acre of available land, and to keep the production continuously on this basis.* Our present agricultural knowledge certainly does not warrant any such extravagant hopes. My own personal belief is that Pearl's prediction of approximately 200 millions as a saturation point under present standards is more in keeping with the facts.

To those who are disinclined to agree with me, let me point out that during this little arithmetical recreation, no account has been taken of a margin of safety. And with a saturated population there must be a good broad margin of safety or the spectral form of famine will soon be stalking in the land. Human ingenuity cannot control climatic conditions. Fat years and lean years will come, and they cannot be predicted in advance. For example, take the corn-crop of 1901. For a number of years the country had been producing close to 2,000 million bushels annually. In 1900 the yield was 2,100 million bushels. Without warning, hot dry winds swept the country during the summer of 1901, and played havoc with the crop. The yield dropped 25 per cent, to 1,500 million bushels. Again, take wheat, the white man's staff. During the three pre-war years, 1912, 1913, and 1914, the wheat-crop had averaged approximately 800 million bushels. In 1915 it reached 1,000 million bushels. In 1916 the chinch-bugs and the weather man combined to drop it to 636 million bushels. Suppose such things had happened when by terrific agronomical struggles the average productivity of the whole country had been doubled and every available acre had been utilized because 331 million people begged for food. Assume also that by this time there were no countries still in the era of increasing returns in agriculture, no countries therefore with food to sell. What would happen? Some 50,000,000 people would starve; that is all.

This is a harsh statement, but no less than the truth; for one must remember that the reduction in the number of domestic animals which inevitably comes with the approach of population saturation destroys the important safety margin existing at present. To-day, meat animals form a considerable proportion of our diet; and at a time of crop shortage can be marketed in larger quantities than usual, thus not only increasing the farmer's income at a time of need but releasing large amounts of grain for direct human consumption. When man has ousted the ox and pig from the grain-bin because he needs their fodder himself, he has allowed a valuable dietary insurance policy to lapse. Thereafter he will have to do as Pharaoh did, lay aside food during the fat years,—and storage rates are high.

This argument shows how the land lies—both metaphorically and actually—but it has been made in rather general terms. There can be no real insight into the agricultural situation unless it is examined in some detail.

In passing, it may be well to take the props from beneath the air-castles of those credulous day-dreamers who expect all future troubles to be straightened out by the genius of the test-tube shaker. There is even a small minority of the chemists themselves with such an exaggerated view of their own ability they predict future cultivation of the Sahara after rain-making has become an established art, and synthetic tabloid food in plenty as soon as they have learned the trade.

If a man once has such ideas firmly implanted in his skull, there is no use arguing with him. *Il est fini.* But to those who are open to conviction, these views do not appear to be very sound. The first idea meteorologists place in nearly the same category as perpetual motion. It may be possible in time to call forth a limited rainfall over a restricted territory; but enough is now known of the natural course of air-currents, of the moisture content of the air over large areas, and of the physical obstacles in the way of changing the conditions prevalent naturally, to cast aside this hope forever. The other suggestion has less of the miraculous back of it. A distinguished English chemist claims to have made one of the common sugars in his laboratory, and nearly a generation ago a German chemist synthesized a polypeptid, which is closely related to the simpler proteids. We are still a far cry from producing real proteids, and Osborne's discovery that even the digestive system is incapable of manufacturing proteids for an animal's own private use unless supplied with all the necessary constituents in the particular form of eighteen or twenty distinct and complex amino acids, seems to put this event into the far-distant future; but he would be a hardy man who denies all possibility of their manufacture as laboratory stunts. The important point is not the impossibility of foods being put together by the chemist, but the extreme improbability of his being able to do it cheaply enough to make his labor of any avail in solving population problems. He must start with inorganic raw materials, water, air, and products of the soil. To use organic products would be a sheer waste, because all the arable land is assumed to have been brought into use, and to have been planted with productive crops. He must then take the cheapest and most widely distributed of inorganic compounds and combine them by the utilization either of the direct rays of the sun or of its energy stored in the form of oil or coal. All of which brings us to a formidable criticism. *Man has never been able to utilize energy mechanically with anything like the comparative efficiency of the lowly vegetable.* Not only do peas and beans, potatoes and wheat, use the energy of the sun in stimulating chemical reactions incomparably better than man is able to do, but they are automata who work for nothing and never go on strike. Furthermore, we know quite a good deal to-day of the principles of thermodynamics, and there is not a single fact leading toward the belief that we shall ever be able to outdo the advantages these automata hold.

Returning now to the question of our agricultural prospects, let us give the problems of agronomy our attention, not because there is a possibility of human genius solving the population problem by any given increase in productivity, but just to give us a conception of the probable limits. The problems of agronomy have been specified, because, after all, the fundamental task of agriculture is the production of primary foods, the plants. Food animals, fowls excepted, are luxuries which must tend to disappear with an increasing population. They are secondary products of agriculture, using up food not much more efficiently than human beings and forming thereby the most expensive part of our dietary system. The difference is roughly eight to one, meaning by this that it takes eight times as much land to provide a man with a diet wholly of meat as it does to provide him with nourishment from vegetable sources only.

A question often occurring to every one who has given the subject consideration is this: Why doesn't the agricultural explorer or the botanical collector bring in a new plant now and then that will please the gourmet, satisfy the dietitian, and at the same time give the farmer two bushels where formerly there was but one? To tell the truth, they haven't a respectable fighting chance. The men of the old stone age did it for them. *Every single one of the important plant-foods was discovered and brought into cultivation by prehistoric man.*

Our bygone progenitors must have been pretty busy old fellows, and just as keen as their descendants. Apparently they pounded up and made the flapjacks or stews of nearly everything that grows, and passed the word along whenever they found anything worth their while. The interesting outcome of all this experimenting is that man lives on grass, and thus proves he isn't much wiser than his ox or his ass when it comes to satisfying hunger. Probably 60 per cent of the total diet of the whole 1,700 millions of us comes from the grass family; there are wheat, corn, barley, oats, rice, and several lesser grains. Next in importance come the legumes, the peas, beans, and lentils; then there is a varied assortment of vegetables and fruits, and, finally, a series of nuts and other oil-producers. The list of first-class foods is very, very small. There is a huge lot of foods used to a limited extent as local tidbits; but they all have their drawbacks. Either they are too particular about the place they grow, or they are not palatable to every one, or they reproduce their kind sparingly, or they have developed some other preventive to cultivation on a grand scale.

Primitive man everywhere found his nutritional needs to be rather circumscribed. He came to pretty much the same conclusion in various parts of the world even as to the proportion of protein, carbohydrates, and vitamine-carriers necessary for his welfare. He was not aware that certain oils, vegetables, and fruits carried those mysterious life-savers now termed vitamines; but he found that these foods contributed to his well-being, so he forthwith used them.

Of course no one can predict absolute failure for future efforts to introduce new food products which will supplant some of those now in use because of easy production in quantity. But isn't it more than a guess to suppose that if savage tribes in widely separated parts of the world came to use cereals, vegetables, and fruits from the same families, that if even their narcotics and their arrow poisons were related, the next few thousand years will bring no revolutionary discovery in this field? There will be a more general use of certain fruits, vegetables, and meats which are now confined to rather narrow limits; but after a rather intensive study of the edible products of the world and their wild relatives, I, for one, must remain sceptical as to the probability that the future will bring us anything new of importance.

No one can deny that we are not now utilizing every food resource at hand. In this respect there is bound to be reform when the population pressure of the world as a whole becomes overpoweringly heavy; though it really does not do to be too sanguine about the immensity of the prospects. The most important source of new types presumably will be the water rather than the land. Considerable quantities of additional food products may be obtained by cultivating the streams and lakes; and in the ocean there are whales, seals, sea-lions, fish not found in any markets, molluscs, and seaweeds. They may not be particularly palatable, but necessity is a hard master, and as intensive use of the land increases, so also will intensive use of the sea increase. The most promising opportunity for more extended use of novel foods on the land is in the matter of tree products, because this means a dual purpose for that large proportion of the soil which must be kept covered with forest.

In this connection I should like to mention a cheerful book on *The World's Food Resources* by J. Russell Smith.[1] Doctor Smith appears to believe that the world can go on increasing indefinitely both in people and in happiness because of the unused food ready for the taking. He neglects to emphasize the fact that there will be an ever greater difficulty in getting more and more food to the consumer, and all in all shows his first-hand knowledge of agriculture to be much more limited than his hopes. But the error which makes his very readable book more of a menace than a consolation to the uncritical is still more elementary. One after another food plants are taken up and exploited. It is shown how limited are the areas upon which they are grown. Suggestions are made for their extension to colder climates, to hotter climates, to more arid regions. Hundreds of foods of limited distribution are to be cultivated on countless acres. After all is said and done, then, what Doctor Smith is really recommending is a more varied diet, and this is a recommendation suitable for a new territory of increasing agricultural returns and a relatively small population, not for a country or a world saturated with people. When the arable land is all taken up and is being cultivated as intensively as possible by workers who need to make every square foot yield its best in order to keep the wolf from the door, it is no particular relief to him to tell him he might grow mangoes or taros or something else he never heard of, unless these plants will give him a better return than what he is then raising. In other words, one crop at a time and full use of the growing season is all that can be done. If land is growing maize, it cannot grow wheat or potatoes. If I may venture a prediction, I should be inclined to say that increasing population pressure will bring about the use of fewer crops rather than the reverse. The easiest way will be to produce high-yielding varieties adapted for different conditions of soil and climate within a very limited number of species. We shall cover our land with the best crops compatible with strict dietary necessities, and there we shall stop.

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[1] Smith, J. R., *The World's Food Resources*. N. Y.: Holt, 1919.

Many botanists and agriculturists who admit the improbability of domesticating new plants having great economic value, and who do not overestimate the relative importance of the unused wild fauna and flora, put their trust in new varieties of plants and new breeds of animals to be evolved by the scientific breeders of the future. Here again one must be very careful not to make too great a cry over little wool. Theoretical plant-breeding and animal-breeding, under the name genetics, have made tremendous advances in the past twenty years. There is really some fair knowledge of the rate at which organisms vary, of the type of variations that occur, and of the mode by which these variations are transmitted in inheritance. This knowledge places us in a much better position than ever before for predicting practical results.

The whole matter appears to work out somewhat as follows: Useful variations in the domestic plants and animals are very rare. The prospects of increased yields and better quality of food products through straight selection of variant individuals is extremely low. The hopeful method of attack is by hybridization; yet even here it is doubtful whether a betterment greater than from 10 to 20 per cent can ever occur. The great cereals, vegetables, fruits, and domestic animals all belong to ancient species which have wild relatives that will usually cross together and give partially fertile hybrids whose progeny are inordinately variable. Selection from among the types thus produced probably gave the useful varieties of to-day. Indeed there seems to be a natural law to the effect that useful genera are those which have varied greatly in their characters, and yet have retained a sort of sexual compatibility which permits them to cross and produce hybrids which are not wholly sterile.

It is undoubtedly true that constant labor by organized workers scientifically trained will give better strains of these products. They will be obtained by methods similar to those followed by nature, but they will be obtained in shorter time. The one thing modern science has done, whether it be building bridges or producing new breeds of apples, is to teach us how to save time. Nature cannot be hurried unduly, but useless effort can be eliminated. Instead of growing large quantities of first-generation hybrids and making selections from among them, as was done formerly, selective elimination is made solely in the second generation where the recombination of types is found. Instead of worrying about the supposed evil effects of inbreeding, advantage is taken of the process in fixing types. Instead of working solely for stability of types in sexual reproduction, the vigor of hybrids is utilized and uniformity retained by asexual propagation through cuttings and grafts. Thus agriculture benefits by pure science in the same way as engineering and chemistry—the short cuts are found and put into service.

There is absolutely no question but that the yielding power of the standard crops will be increased and their food value augmented. The ravages of insects and of fungi will be reduced by creating resistant types. Mankind will push agriculture northward and enlarge the dry-farming regions by using varieties adapted to the conditions met. But with all this, one must remember that no new processes are involved, and the few time-saving devices now being used—or in prospect of being used—for the evolution of new forms of plant and of animal life are not going to increase the resources by leaps and bounds. The prospective increase is relatively small. Similar development has been going on for thousands of years, and the labor-saving methods just described will only hasten matters a little. There will be no revolution.

Let us suppose that the maximum prediction will be realized. By the expenditure of time and money for breeding projects on a scale at present beyond the dream of the most enthusiastic propagandist, current production will have been increased by 20 per cent. What tangible net gain has there been? It will permit the human race to pack together a little more tightly on the face of the earth, if this be any advantage; but the dark cloud of stored troubles will loom as forbiddingly as ever. The relief afforded by this method is temporary. What it actually does is to permit the exploitation of a limited store of soil fertility at a greater rate; it is a means of dissipating capital more rapidly.

In a word, then, even the hope of extending the time when there will be the same degree of comfort as in the past is not extremely bright, if the present rate of population increase should continue. Between 1910 and 1920, 16 per cent was added to the country's numbers. At this rate the population doubles in 44 years. Thus, to-day we are tending to a population of 214,000,000 in 1964. That is to say, if the current expansion rate is not decreased, men of the present generation will see the United States peopled beyond the maximum agricultural possibilities set by the calculations made a few pages before. Since the old axiom still holds that the container must be larger than the thing contained, it follows that this rate will be cut down. The only question is whether it will be cut down because we wish it or because we cannot help it. It is a hard fact that the probability of food increase is not in keeping with this rate.

This last paragraph was injected into the discussion in order that there might be no opportunity to lose the real meaning of these agricultural facts in a labyrinth of argument. We have been regaling ourselves by dreaming about agricultural miracles, which would set everything right. Let us awaken to realities, and examine the old art of agriculture as we actually find it. After all, the brightest ray of hope for an increasing return per unit area is from efficient application of the best methods of crop rotation, tillage, protection, harvesting and marketing, made possible by increasing the amount of man-power used. There is no royal road to raising turnips.

If we do this calmly, without bias, and accept frankly the statistical results coming out of the mill, five conclusions will be reached:

1. The people in the United States revelled in cheap food in the past because low-priced land was so plentiful they could be satisfied with whatever returns were obtained by the hasty inefficient methods of culture made possible by the powerful tools of industry.

2. The reserve of virgin soil approached an end in quantity, or, what amounts to the same thing, decreased markedly in quality between 1890 and 1900. Since that time there have been diminishing returns in agriculture in the sense that a given amount of capital and of labor has produced constantly less and less.

3. Better methods of agriculture will allow enhanced production per unit area amounting to at least 50 per cent over the current amount, but this will only come about through an increased use of man-power.

4. All increase will be temporary, and even current production cannot be maintained, unless the essential elements of soil fertility are conserved by every method possible.

5. If comfort and satisfaction on the farm are not equivalent on the average to what is obtained in other walks of life, if agriculture is to be at the mercy of powerful industrial labor-unions directed by narrow, scheming opportunists, or stifled by the short-sighted greed of capital, this machine-made civilization of ours will shortly burst like a tree which is rotten at the heart.

Such general application of improved agronomical methods as has come about in the United States in the past generation has yielded valuable results; but these results are difficult to demonstrate statistically. Wheat yields by decade averages centring on the census years 1866 to 1915 were 11.9, 12.3, 12.7, 13.5, and 15.0 bushels per acre. Indian-corn yields for the same periods were 26.1, 25.5, 23.4, 25.2, and 26.6. Other crops showed similar trends. There were slight increases in production per acre, but the percentage rise is disappointing. Collateral evidence shows the true increase in production due to better farming to be really worth while; it may be as high as 50 per cent in half a century. The difficulty in proving this directly is because it is offset and masked by the poorer new lands brought into cultivation, and by the impoverishment of certain of the older lands.

There is no doubt whatever regarding the concrete effects of better farm methods to-day or in the future. The only words of caution are in regard to the amount of increase to be expected. Perhaps a basis for an estimate of future prospects that will not be far from the truth may be obtained by comparing the yields in the United States with those of some of the older countries where highly intensive systems of agriculture have been in operation for a considerable term of years. Some enlightening figures are found in a recent compendium of foreign agriculture published by the Department of Agriculture (Bull. No. 987).

AVERAGE YIELDS OF CERTAIN CROPS FOR THE THREE-YEAR PERIOD 1915–1919

Bushels per acre

	Wheat	Corn	Beans	Barley	Potatoes	Rice
United States.......	14.3	26.3	10.1	25.6	92.7	38.4
United Kingdom	31.8	....	27.3	32.9	213.9	....
France............	16.5	16.8	13.3	21.4	99.0	....
Italy..............	15.0	23.7	3.3	17.4	71.1	46.5
Japan.............	22.6	26.6	14.2	25.0	151.6	51.8

These data are only a sample of what might be cited; and they are quite instructive, though they need a little comment before drawing conclusions. The yields of Italy and of France were cut down somewhat owing to the war. To be wholly fair, perhaps they ought to be raised about 10 per cent. Then again Japan does somewhat more than the other countries in the way of raising two crops per year on the land, though the only crops listed here which are affected are beans and potatoes.

Now what does one see? Japan with mighty efforts is raising only a little more provender per acre than the United States. The United Kingdom leads the countries cited in agriculture per unit area, and her production is something like 75 per cent greater than that of the United States. On the whole, France is doing just a little better, and Italy not quite so well as ourselves.

It seems more satisfying to one's self-respect to have concrete data before him and thus to be able to make his own comparisons. But this is not the best way unless the data are extensive, because there is a great temptation to compare the smallest yield with the largest yield and to set up the latter as the goal for all the world, without realizing how much of this difference may have been brought about by extreme climatic conditions. The really scientific method of comparing the agricultural efficiency of different nations is to reduce the whole crop efforts of each country to a single index-number, as has been done by the statisticians of the Department of Agriculture in the Year-book for 1920.

Six crops—wheat, oats, barley, rye, corn, and potatoes—comprise the bulk of the crop production of the world—five grasses and a tuber. Before the war they made up the following percentages of the total areas devoted to cultivated crops, excluding hay: Germany, 82 per cent; France, 75 per cent; United Kingdom, 72 per cent; Holland, 70 per cent; Belgium, 75 per cent; Austria, 84 per cent; Hungary, 87 per cent; Italy, 45 per cent; Spain, 65 per cent; Rumania, 92 per cent; European Russia, 87 per cent; Asiatic Russia, 91 per cent; Bulgaria, 85 per cent; Japan, 31 per cent; Australia, 91 per cent; Canada, 91 per cent; Argentina, 88 per cent; the United States, 82 per cent. Thus they represent fairly the agriculture of the more important countries, with the exception of Italy, which raises more vegetables, and Japan, where rice should be substituted for corn. In the case of Japan this substitution would raise her index-figure by some ten or fifteen units; Italy's rating would not be changed materially.

The indices were calculated from the returns on these six crops in the following manner. For each country the average yield of each crop was obtained for a series of years, and these averages reduced to their percentage of the average yield for all countries. The percentages for each country were then combined, and weighted in proportion to the relative acreage of the various crops in the country to obtain the index-figure. The base, 100, represents the weighted average of all the countries considered. The results follow.

INDEX-NUMBERS OF PRODUCTIVITY IN VARIOUS COUNTRIES

Belgium	221	Chile	136	Rumania	94
Holland	190	Sweden	128	Spain	93
United Kingdom	177	France	123	Australia	76
Germany	169	Austria	120	Argentina	75
Denmark	168	Hungary	113	Russia	71
Japan	137	United States	108	Mexico	52
Canada	136	Italy	96		

Thus, on the average, the older and more densely populated countries have not been able to make any wonderful strides in agriculture. Little Belgium leads the world with twice our own agricultural efficiency, the United Kingdom leads us by 69 per cent and Germany by 61 per cent, but Japan with her masses to feed exceeds our production by only 40 per cent, even when allowance is made for her neatly cultivated rice-fields. It seems improbable, therefore, that the whole stretch of this great country will ever be able to double its present productiveness per acre of land. When a man says we ought to be able to triple or quadruple our production, he is talking nonsense.

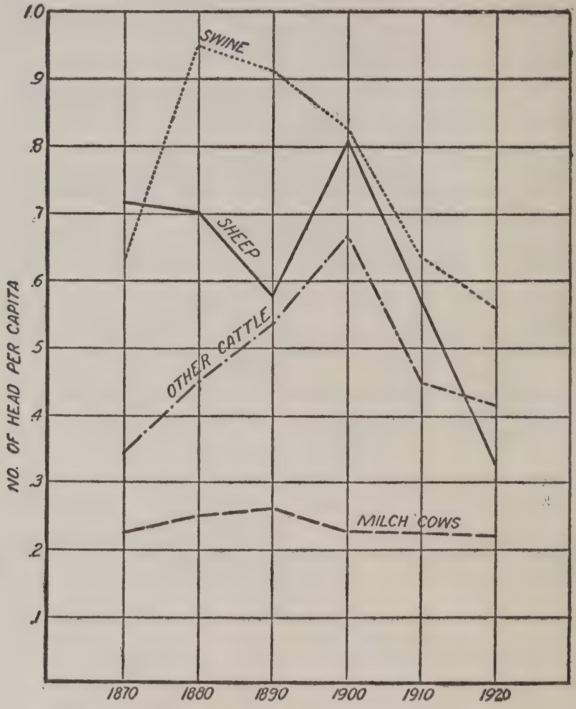

Fig. 7. TREND OF MEAT PRODUCTION IN THE UNITED STATES.

There was a great expansion of agriculture here between 1860 and 1880. It took the form of meat production on the public grazing-lands and of extensive shallow-cultivation farming by means of new farm tools which allowed one man to attend many acres. The virgin lands of the Middle West were opened up and brought into cultivation with extreme rapidity. Low yields resulted from these methods, but the number of new acres utilized was so great that overproduction and very low prices prevailed. To realize this, all that one needs to do is to recall the time thirty years ago when porterhouse steaks sold for 15 cents per pound. The reason for the increase in price to-day, after computing to a base which makes allowance for the general decline of the dollar, is seen in the reduction of meat animals per capita. The census gives the enumeration of domestic animals at the end of every decade. The peak of swine production, .951 per capita, was reached in 1880. In 1910 it was .633 and in 1920 .562. After various fluctuations sheep production reached .809 in 1900. In 1920 it was only .332. Australia and Argentina were exporting cheap wool, and mutton production no longer paid the dividends it did before. Milch cows have remained rather constant, as might have been expected, but the tendency since 1890 is downward. Production of other beef cattle, the technical term for what is perhaps the chief meat-supply, has dropped from a high point of .666 in 1900 to .418 in 1920.

The grazing-lands of the early days are gone, and with them low-priced meat has passed. They have gone because they were put under cultivation for the increased population. And still greater increase of population has recently caused them to be cultivated more intensively. It is only natural that this should be so. It is the general history of every new country. The cream is skimmed off during the early days of cultivation by extensive, careless methods. Then more intensive methods prevail; and the yield per acre increases while the yield per man decreases.

There is conclusive evidence that the output per man is diminishing, despite the improved varieties of the staple crops and the new machinery for tilling them, despite the more general adoption of crop rotations and pest-control measures. This means that we must work harder for what we get.

In Thompson's[1] valuable study on population, which because written as a technical study in economics has unfortunately had much too limited a circulation, the United States was selected for special inquiry as to the tendency of returns in agriculture. Thompson says: "There are two reasons for doing this: (1) the agricultural situation in the United States is relatively good, and if there are any evidences of diminishing returns here we are justified in assuming that we should find still better evidences in most of the older countries and that the newer countries are rapidly approaching the situation of the United States; (2) the data are more available and can be more easily verified."

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[1] Thompson, W. S., *op. cit.*

The result of this investigation without going into technicalities is roughly this. In the decade after 1900 the population increased 16,179,940, or 21.3 per cent; the rural population during the same period increased only 4,963,953, or 11.2 per cent. Since everybody was fed, these figures would seem to indicate increasing returns. But one must not jump at conclusions. During this period a lot of things happened that took up the slack engendered by previous production tendencies. They come chiefly under four heads: (1) better transportation and storage facilities cut down the waste, (2) decrease in the number of animals raised lessened the competition for food between the inhabitant of the home and of the pigsty, (3) a greater number of labor-saving devices, particularly in the way of extra agricultural activities, permitted the farmer to spend a greater percentage of his time on actual tillage of crops, and (4) food exports decreased and food imports increased to such an extent that at the end of this decade the country had changed from a great food-exporting nation to one where the outgo barely balanced the income.

For the whole of the last decade the United States was not really a food-exporting country. Normally the people consumed what they produced. In the three pre-war years 1911–1914 the total average export of food was 52,746 metric tons less than the imports, though the former still excelled the latter in value. In 1920, after the excitement of the war was over, exports dropped and imports rose until the country was again on about this same basis. During the four war years the annual export balance of foods reached the huge figure of 3,169,495 metric tons. But it was an artificial combination of high prices and good luck that made the change. There was a sharp incentive to work in the form of prices such as had not entered into the wildest dreams of the most imaginative farmer. True, when he had totalled up his balance-sheet after paying for wages and supplies at three times the normal, he was not so much ahead; but he did not do that until the bottom dropped out in 1919. Then again the farmer played into real luck. With the exception of 1916, the crops of the war years were extraordinarily good. About one and a quarter blades grew where but one grew before.

During this decade the value of all farm property rose from 20.5 billions of dollars to 41 billions of dollars, but this means little except as indication of an increasing population and a decreasing reserve of public land. What is more to the point is that improved farm acreage increased but 4.1 per cent, and that the change in the number of farms (10.9 per cent) was about the same as the change in the rural population. With an operator on each farm and the rural population increasing at the same rate as the number of farms, the probable difference in the amount of labor expended is the difference in the time the farmer previously spent on activities connected with the business of living other than agriculture, what one might call the mail-order house saving. Thompson makes no estimate for this figure; but my own guess, after a good deal of travel and inquiry, is about 10 per cent. Against this additional time one has to put the increased production per acre. According to the *Crop Reporter* this rise was 6.1 per cent for corn, 7.5 per cent for wheat, 9.1 per cent for oats, and 7.7 per cent for potatoes.

Thus the weighted average (on acreage) increase of production of the more important crops was slightly over 7 per cent.

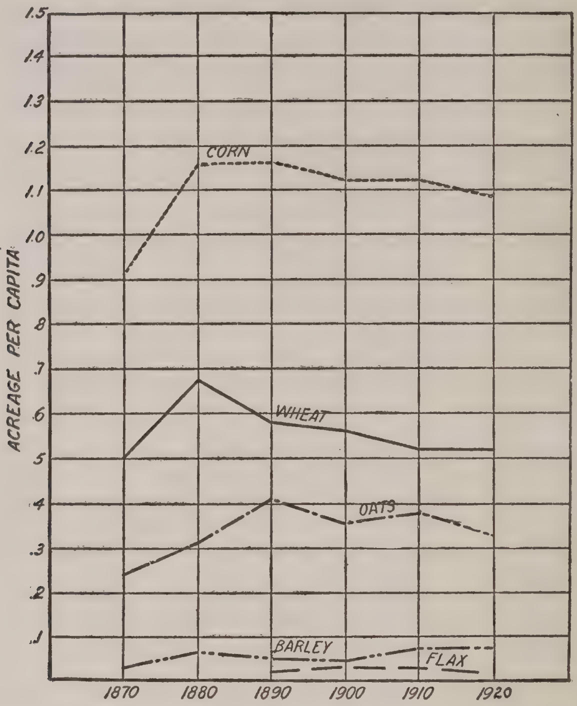

FIG. 8. TREND OF ACREAGE PER CAPITA OF CERTAIN CROPS IN THE UNITED STATES.

Decreasing acreage per capita indicates diminishing returns in agriculture even though yields per acre are rising.

Thompson believes the tremendous change in capital involved during this period, with labor just under holding its own, shows extraordinary decline in returns in the economic sense. It certainly is significant that of the 100 per cent increase in farm capital, only 19 per cent of it can be attributed to the general rise in prices during the period. But, as was stated above, while the unearned increment which accounts for the general rise in farm values undoubtedly has a relation to the question under discussion, it is difficult to analyze its complexities into simple components; so, as did Thompson in summing up, it may be left out of consideration. What does clinch the matter, as Thompson shows, is the fact that the capital involved in instruments of production, excluding live stock to be conservative, increased 12.6 per cent as against the 7 per cent increase in production per acre.

By similar arguments it can be shown that during the previous decade, between 1890 and 1900, the labor time per acre was less in comparison with the returns. Apparently, then, one may date the coming of diminishing returns in agriculture in the United States with the arrival of the twentieth century.

There is no need to feel blue about these results, but there is something to be gained by not making it a practice to look at prosperity through the right end and at adversity through the wrong end of the telescope. The tendency toward intensive farming is making headway. The average yield per acre of all crops between 1910 and 1920 was about 16 per cent greater than between 1880 and 1890. If, on the average, the American farmer proves as efficient as the English farmer, future yields may be raised 75 per cent over those of to-day. Perhaps through plant breeding and better methods of tillage, production may even be doubled. But it must not be forgotten for an instant that it will take more toil per acre to get these yields; the ploughman's way will be wearier as the days go on. Those who point out that we have not yet reached the yield per acre of the best farmers of Europe would do well to keep this point in mind. The most intensive Continental farmers, the Belgians, cultivate about 5 acres per man; in the United States the comparative figure is 26 acres; and the Belgian yields are not 5 times our own, but are just about twice as great. Japan puts in over 50 times our labor per acre, and her yields top ours by not over half again as much.

Now nothing makes the reader seasick quicker than being piloted over an ocean of figures. Therefore while sailing gaily along we must again emphasize the point at issue. By bending to the work, the yield per acre of the lands at present under cultivation can perhaps be nearly doubled. There is still a considerable expanse of fairly good land in reserve, and the agricultural limits can be extended by taking in poorer land until cropped acres are more than half again what they are to-day. It follows that many more mouths can be fed. But this does not prevent the agricultural situation from being serious. Our farm system just grew, like Topsy, through response to the crude directive agency of the law of supply and demand. It has no more fundamental efficiency as a national business than the Haytian army. We can, therefore, do one of two things: let it follow this natural evolution and some day have a disruption like that of Russia with all of the consequences, or put it on a business basis like the manufacture of Ford's tin engines on wheels.

Perhaps there will never be a debacle in this country comparable to that in Russia; but it is more likely to be prevented by deeds than by faith. There is already serious unrest among the toilers of city industrial machines, though, despite many real grievances, they are better paid for what they give than the farmer. What if he begins to surge and urge for a six-hour day and a five-day week?

Under the best construction possible to put on the whole situation, it boils down to this. Assuming agriculture to be on a permanent basis, the end of expansion is in sight. We can measure the length of the trail and can calculate just when we will arrive at any given speed. And there is nothing but a booby-prize at the end, greater hardship, and a huge census return. We can do just what we wish about the matter. It lies in our own hands. We can put in play all the farm aids we have discussed and can raise our food production to its maximum limit. Meanwhile we can keep up our present population increase and thereby reach a point of saturation where it is firmly repressed by a high death-rate caused by the increasing severity of the struggle for existence with its long work hours and short rations; or we can make for better things by restricting our numbers to a limit which can be provided for satisfactorily and easily, if we put agriculture on a permanent scientific basis for all time. Without this final premise I can see nothing in all the other efforts but temporary expediency. Let us, therefore, discuss a permanent agriculture.

The true arbiters of food production are soils and climates, and one can do little to make or mar a climate. Soil, then, common brown earth, is the limiting factor which shall determine not only the number of people the world can contain but also their comfort and therefore the final trend of their civilization.

The soil, the home of the plant, consists of minerals, water, gases, and the dead remains of various organisms; but it is affected markedly by all sorts of living plants, from bacteria to flowering types, by animals such as earthworms, and by various forms of radiant energy. It is clear therefore that the study of soils is a complex matter necessitating the energies and the knowledge of chemists, physicists, physiologists, zoologists, and botanists; and it will undoubtedly be many years before there can be a precise classification of the activities which are mixed up in crop production. Nevertheless, one can clear the field for current discussion by eliminating certain things. A thousand absolutely essential factors may be involved in producing vegetable foods, but if some of these factors are never absent, if others can be influenced only slightly, interest centres on the remainder. Now a great many of the problems of agriculture are simply those of mutual adjustment. For example, plant growth of economic importance is limited by the natural water-supply, with the exception that a small amount of land may be made available for crops by artificial irrigation; but all plants do not utilize the same amount of water, and agriculturists endeavor to fit crops to the environments they require. The same thing is true of energy requirements. One variety may suit the south, another the north; one type may fit shady ground, another may grow only in the sun. Again, it is possible to make readjustments of the natural fauna and flora of a soil so that the services performed by the lower animals and plants shall not be lacking. The soil questions of greatest importance thus come down to those known as the problems of soil fertility.

One thing upon which all authorities agree is that natural soils differ in their productivity, and that particular methods of treatment may enhance or lessen this productiveness. Upon the proper interpretation of these acknowledged facts depends the whole future of the human race. Upon the truth as we see it to-day, therefore, should depend our attitude toward current agricultural policies.

The ideas of soil fertility accepted by most chemists and physicists have grown out of the theories advanced by the father of organic chemistry, Liebig. He showed that crops removed various elements from the soil. In particular, there were three, nitrogen, phosphorus, and potassium, which were removed in large quantities and in which many soils soon became deficient. His remedy was the application of compounds containing these elements to the soil. Thus he endeavored to give a chemical justification to the age-old empiric application of certain materials to the soil as fertilizers.

The Liebig theory is an exemplification of the old adage, you cannot eat your cake and have it. If you use up the natural fertility of the soil, it is gone. Four minus two is two.

Elaborations of this theory have been generally accepted. We cannot consider critically all of the reasons why it has found acceptance. Thousands of controlled experiments have been made, and with the most concise abstracts possible the discussion would run into several volumes. Suffice it to say that they all point to the truth of the following points: (1) With the exception of the three elements, nitrogen, phosphorus, and potassium, all ordinary soils contain practically inexhaustible quantities of the elements essential to plant life. (2) Application of nitrogen, phosphorus, and potassium to soils which are deficient in them nearly always gives increased plant growth. (3) Application of a single one of these elements to soils where that element alone is deficient gives a similar increase. (4) Application of one or more of these elements to soils in which chemical analysis shows there is no deficiency results in little if any increased growth.

It seems to me no extended argument on these points is necessary.

Plants will not grow without nitrogen, phosphorus, and potassium, and these three elements exist in very limited quantities in most soils. The amounts removed by the plants can be calculated with great precision, and the amounts lost through leaching can be estimated with a fair degree of accuracy. The result by the arithmetic commonly in use is to find that the majority of soils cropped intensively without fertility replacement have a "life" ranging from a few generations to a few hundred years. Of course one cannot calculate a period at which a soil will become absolutely unproductive, for the crops merely diminish at a more or less constant ratio, but one not only can calculate, he can actually point to experiments of the Rothamstead, the Illinois, the Ohio, and other agricultural experiment stations, where continuous cropping for a quarter of a century without rotation or the use of fertilizers has brought the crop return to a vanishing-point so far as economic profit is concerned.

Unfortunately too many people fail to realize the gravity of this situation. They feel that since the world has "carried on" in the past it will "worry through" in the future. There is a *laissez-faire* policy in agriculture as well as in politics. They argue that as numerous soils in Europe show an increasing productivity after "thousands of years of cropping," as the use of fertilizers is comparatively recent since the German potash deposits were only opened in 1862, and as the composition of these soils compares favorably with that of rich soils in the United States, it is impossible to maintain that soils wear out. One might well rest the defense on common knowledge of arithmetic, as before, but there are some concrete statistical fallacies in this argument which should not be passed over in silence.

In the first place, it should be realized that Europe has not been cropped to death for thousands of years to support an exceedingly numerous population, as is supposed by certain writers. A careful examination of the available statistics of population in England, France, and Germany leads to the conclusion that Europe as a whole has almost *tripled* in population during the last century. Europe, then, is only now being cropped to death; her soils have *not* really been tested out for centuries. Further, the statistics of crops cited in these arguments are evidently from particular farms. Only very up-to-date efficient plantations would keep records for decade after decade. Whether they came from especially rich farms or not, any increase in crops could undoubtedly be attributed to a gradual infusion of modern methods of tillage, crop rotation, and machinery. And if this be not enough to account for the results, one can turn to the use of fertilizers, for although the use of pure chemicals is modern, the use of stable manure on crops is probably as old as husbandry. Do you recall Streeter's *Dere Mable* books? In one place he says: "You can tell how rich a Frenchman is by the size of his manure pile. The bigger the pile the bigger the man you are in your home town. All I can say is I'm glad the people we live with are poor. I'd hate to be billeted with the Mayor."

This is not only France, it is all Europe. Only by painstaking conservation of the better soils has Europe managed to come as near to feeding her population as she has, and still she is on the wrong side of the import-export ledger by millions and millions of tons annually. We have not reached the point where necessity brings such careful husbanding of resources. We are the prodigal heirs; nevertheless, the day of accounting is on the calendar.

We have a comparatively new, supposedly inexhaustible country here. Its problems of population and their sustenance may be presumed to be light and easy as yet compared with those of some of the older parts of the world. But the problems are the same in type. We are approaching those already met by the Chinese; we are confronting those which will be met later by the colonizers of Africa and South America. The great truth is that our soils are limited in their fertility, severely limited. They do wear out. In many cases they are wearing out and they are wearing out fast. Some of our farms have already had to be abandoned because of depletion to the point of exhaustion.

If further evidence is needed, there are the reports of the controlled experiments at the agricultural experiment stations of Illinois, Ohio, Rhode Island, and elsewhere where the facts are stated without mincing matters.

The supply of nitrogen is practically inexhaustible, since it forms four-fifths of the earth's atmosphere and can be obtained cheaply either by means of the nitrogen-accumulating bacteria which attach themselves to leguminous plants or by straight processes of industrial chemistry. But Hopkins[1] has calculated from thousands of analyses that the average supply of phosphorus in the 2,000,000 pounds of soil covering an acre of land to the usual plough-depth, six and two-thirds inches, is only 2200 pounds, or enough for 130 crops of corn at the rate of 100 bushels per acre. Potassium is more plentiful, there being 49,200 pounds, enough for 2600 of these same corn-crops.

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[1] Hopkins, C. G., *Soil Fertility and Permanent Agriculture.* Boston: Ginn, 1910.

But the trouble is, many arable soils do not contain even these amounts of the essential elements of soil fertility. Compare the plant-food in the following two fertile soils of Holland and Scotland with that in the two unproductive soils of Germany and of Maryland.

POUNDS OF PLANT-FOOD PER ACRE OF PLOUGH DEPTH
2 Million Pounds. (After Hopkins.)

Plant-food	Holland alluvium	Scotland wheat soil	German barrens	Maryland barrens
Phosphorus..........	4,100	3,780	trace	180
Potassium...........	17,040	5,880	none	2,000

The Holland soil contains eight times as much potassium and twenty-three times as much phosphorus as the Maryland soil.

Hopkins says: "All of the level upland soils of Southern Illinois were far past the maximum in productive power when the country was first settled. Indeed, much of the land of central and northern Illinois was past the maximum and tending toward depletion. Probably the black clay loam of the flat prairie lands in the Wisconsin glaciation was almost at its maximum condition of productiveness when the White Man took possession, but even the soil of this topography was far past its prime in the lower Illinoisan glaciation."

This statement takes on a more serious aspect if it is realized how relatively fertile are most Illinois soils when compared with others scattered over the land. Soil chemists have found many level upland soils in the Southern States to be too inherently unproductive to justify cultivation, varying as they do from 200 to 400 pounds of phosphorus in a ploughed acre. The passer-by rolling though these districts in his limousine often sees in such regions a reserve of fertile land. He takes the position of some of the travellers in China who behold hundreds of square miles of uncultivated level uplands where no one lives, and thinks to himself that the population saturation point is even there a matter of the distant future. But to the Chinese official with the good of his country at heart, the restoration of these same depleted, worn-out, barren soils is the great problem of the country.

Fortunately for the people of the United States few soils have been depleted of fertility beyond hope of a return to fair productive power in the century or so of cropping; but there are very considerable areas along the east coast where moderately fertile soils have been so reduced in productiveness in three generations as to make them unprofitable today. They will be cropped again, but only when high prices make it possible to obtain a fair return on an amount of labor per unit area now unthinkable.

Contrary to the current ideas on the subject, even the soils of the Mississippi Valley, the garden spot of the New World, drop in productiveness very fast unless treated with kindness and consideration. This fact is the answer to the critics who assume discussion of the soil fertility of plough-depth soil to be mere propaganda, and that plant-food from lower depths will become available time without end. No one denies some truth in their comment. Plant-food, even on comparatively infertile soil, becomes available constantly. Nevertheless, this fact does not change the situation. The rate of change is too slow to meet demands and the amount of the most precious element, phosphorus, nearly always decreases the farther down one gets. The truth comes out in actual crop-production experiments extending over a period of years. One of the most interesting of these has been carried on at Urbana, Illinois, since 1879, hence it will soon round out half a century.

Originally on this soil about 50 bushels of corn per acre were obtained without fertilizer. Continuous cropping with corn reduced the yield to one-half as much within twenty years. Rotation of corn with oats helped matters, but still the yield went down. But by using a legume in the rotation and by adding plant-food the yield has mounted to almost double the original figure.

At the Rothamstead experiment station in England similar investigations have been going on for over seventy years with comparable results. Continuous cropping with a single crop reduces soil fertility rapidly. Rotations with crops that utilize soil fertility at different depths and at different rates keeps productiveness from dropping so rapidly; but still it drops. The only way to treat the soil, therefore, is like a bank-account; husband it carefully by proper farming and make a deposit once in a while.

It is our good fortune to have a fairly large supply of potash in most of our soils, and a reserve in our feldspar rocks that science will put into a soluble condition for us in time. The phosphorus, which is more limited, and which is removed by our grain-crops at the rate of nearly 2 million tons per annum, is more of a problem. But there are large phosphate beds in South Carolina, Florida, Tennessee, and the Northwest containing over half the world's visible supply, estimated by Hopkins at 500 million tons.

The matter of prime importance, however, is not the possibility of keeping up crop returns for an indefinite period when all known means are utilized. It is that continued cropping by the present system is depleting most soils rapidly, and that millions of acres have already reached the point where their productiveness can only be kept up by increasing amounts of artificial fertilizers. Much of our natural agricultural wealth has thus been used, with no charge made for it in the production costs. This is bad bookkeeping. No charge for depreciation means bankruptcy in any business. Now that the fertilizer industry is increasing its output day by day, and farming with the use of artificial manures must compete with the production from virgin soils, one can see more clearly what the ledger-sheet of the future must show.

The farmers of the past century received in trust the agricultural capital of the country, but neither they nor the constantly increasing mass of hungry industrial humanity crowded into the cities looked upon it as the assets of a great business. The soil was assumed to be a sort of wishing-bag from which would come a never-ending supply of tasty provender. Pursuant to this main idea the trustees were asked for food at bargain prices, and it was forthcoming. The farmer received just the price of his labor and no more. That the country as a whole should have a sinking fund to take care of depreciation crossed no one's mind.

Presumably this mode of agriculture cannot be called a misuse of nature's capital. No other course seems open in building up a new country. But this does not alter the fact that we were emulating the prodigal son in running through his patrimony. We have fared well by taking no account of how our children will fare. The National Bureau of Economic Research in its recent study, "Income in the United States,"[1] puts its finger on the weak spot in the national dykes when it says:

> Depletion is allowed as a deduction in computing taxable net income, and in the case of lumber, mining, and oil companies we have competent authority for believing that since 1916 at least, the deductions made exceed, rather than understate, the actual amount of depletion. But careful accounting on this head is far from universal among corporations in extractive industries, and it is almost non-existent among those farmers who are "robbing the soil."

The time has now come when the excuse of necessity is no longer acceptable. If something is not done in the near future to counteract the previous neglect, the day of reckoning may arrive with an astonishing suddenness in the shape of a breakdown even of the system we have at present. It does not serve simply to say this could not possibly happen. An object-lesson exists in Russia. This sort of an economic breakdown becomes more and more imminent the greater the complexity of the social system. Given almost any cause which raises dissatisfaction above the critical point, and such events follow. This was seen most prophetically by Balzac, who in *Le Curé de Village* wrote:

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[1] N. Y.: Harcourt, Brace, 1921.

> A proletariat of hardened materialists, with envy their only God, with no other fanaticism than despair from hunger, bereft of faith and belief, will arise and trample the heart of the country under foot.

No doubt those who read these words will expect a constructive policy to be outlined in detail forthwith. If so, they will be disappointed. The output of many keen minds must be pooled to thread the way out of this maze of difficulties.

Personally I think the outlook is very hopeful. Sometimes it takes the jolt of a severe illness to arouse one to the value of an ounce of prevention. This jolt came at the end of the war. Our agriculture was very sick indeed. Secretary Hoover, writing under date of April, 1921, on "Problems of American Commerce and Industry," gives the current price indices as follows:

Farm prices (crops)	115
Farm prices (animals)	123
Wholesale food	150
Retail food	156
Building materials	212
House furnishings	275
New York Industrial Commission wage index	212
Department of Labor, hourly union wage index	199

These comparative figures show the nature of the illness. The slings and arrows of outrageous fortune in after-war readjustment never missed a single farmer. They did not howl so vociferously as the industrial magnate who saw his profits slipping, or the factory wage-earner who hoped to escape the income deflation every one else had to accept, but they were not stunned by any means. After the first shock they were up and about seeking ways and means to adjust the burdens more equitably.

No one who knows them doubts but that they will do it. They will do it because they have a higher average intelligence than the city dweller, as shown by the army tests, even though it may be true that the highest type of mentality gravitates toward the city. The reason for their superior qualities seems to me to lie in the fact that the country population is a pretty high-grade stock taken as a whole. Of the 44 million people making up the white rural population in 1920, nearly 34 millions were native born of native parentage, and almost entirely Nordic. This is in marked contrast to the urban population, where there were only 24 million native whites of native parentage out of 50 millions.

The bright polished mile-stone marking the emancipation of agriculture from the shackles of the past will probably have chiselled on it the date of the Agricultural Conference called at Washington by the President early in 1922. Political speechmaking was noticeably absent; the atmosphere was one of utmost seriousness. It had real character behind it, this Continental Congress of farmers.

From the deliberations of these representatives of the nation's agriculturists one obtained a very stimulating impression. It was the impression that the farmers of the country were not merely a mass of opportunists led by a group of demagogues. They were thoughtful men working long hours in an intricate hazardous business which demands great skill and foresight, who had seen the results of their toil drop one-third in purchasing power overnight. In general, they were disposed to be as fair and unselfish as is given to the lot of man, but they demanded reasonable assurance from the public that economic burdens were to be shared in the future by other shoulders than their own. To those who remembered the undisciplined wild scream of populism some thirty years ago it was an almost unbelievable evolution.

The farmer's plight is being advertised to the world by the

Non-Partisan League developed in North Dakota, and by the activities of the group of men in Congress who have come to be known as the Farm Bloc.

The League has not been happy in its choice of leaders or of methods. It proposes to achieve its wants by force, and its wants appear to be rather cheeky and selfish. It is supposed to be socialistic, but is really a Lenin type of socialism outdoing the absolute in autocracy. It would seem to be destined for failure through this feature alone, even if it should outgrow its naïve proposals born of youthful inexperience for solving involved economic tangles that require expert knowledge and clear reasoning. But, on the whole, the wide-spread publicity it has had has been valuable. It has brought agrarian needs before the public.

The same may be said of the Farm Bloc. Whether the legislation it has espoused is sound or not, it has been a manifest advantage for it to have brought clearly before the American people their absolute dependence upon agriculture, and to have instilled into their minds the necessity of putting it upon a firmer foundation.

But to my mind the real note of progress has sounded from another direction. For years the federal Department of Agriculture and the state experiment stations have been working steadily for increase and diffusion of agricultural knowledge. As is usually the case, the *increase* went along faster than the diffusion. More was known about raising crops properly and marketing them efficiently than was put into practice. Then came the Farm Bureau. As fast as it is made possible a farm adviser paid in part by the Government, in part by the State, and in part by the rural communities, is being put into each county. He has been a wonderful galvanic force, equipped for the job, and carrying it through for its own sake. He makes it his business to organize the farmers, and to see to it that they not only stay organized but enthusiastic about their organization. He helps with crop improvement, with local questions of planting, tillage, and pest control; he organizes co-operative marketing and sees that it gets publicity; and he provides for group buying both for the farm and for the home.

Co-operative farm enterprises had been born many times before; but they had died untimely. The farmer was a strict individualist, and, because of his individualism, suspicious. He was often at sword points with his neighbors, and at times did not play fair with them. He did not understand the spirit of co-operation as an aid to individual survival. But to-day the leaven of education has worked pretty thoroughly through the whole mass. With the power of the Grange, the Grain Growers' Association, the Stockmen, and other able and sane organizations behind the movement, it seems to be going through. The greatest ultimate gain, if it does succeed, will come from the thorough thrashing out each individual problem will receive, resulting in the establishment of sound principles; but there ought also to be immediate progress in the direction of readily available, mobile credits, and of bridging the great chasm between farm and retail prices.

Perhaps the most helpful means available to-day for aiding agriculture is an indirect one—a severe permanent restriction on immigration. Any present cry for immigration can only be made by the fool, the hypocrite, or the ignorant. First there is the individual who wishes to exploit alien labor at low wages, failing to realize that this policy is no more defensible as business than it is as ethics. There are plenty of people whose productive ability is but slightly over the starvation level. They are not assets to the country, and they are liabilities on the floor of a factory. Let us not import them; we will raise a large enough crop of the native article. On the other hand, if this type of business man succeeds in getting worthy and competent employees at starvation wages, his success is equivocal at best. He drives away ambition and reduces output always, and too often forces the development of that pathological ego which magnifies both its own ability and the hardships it has to face.

In the same category belong the transportation companies that have ever been ready and willing to betray the country into accepting undesirables for the thirty pieces of silver involved in a steerage passage.

Then there are those whose sympathies are developed more highly than their brains. They wish to transport their kindred of the fourth degree, root and branch, to this more fertile garden-spot without realizing the chance they take of making the garden-spot something of a wilderness for kindred of the first degree, their children.

Of somewhat the same stripe are the numerous dabblers in sociology who honestly believe immigration should be encouraged for the twofold good of the immigrant and of the country. To such as these one may say: "Do you realize that the immigrant nearly always comes with a lower standard of living and tends to reduce the one he meets by his competition? Do you realize that the unrestrained fertility of the new arrivals depresses the fecundity of the native sons and daughters who know that the time of diminishing returns has come? Do you realize that the smaller the quantity of this artificial increase of population, the greater will be the length of time available to meet the economic readjustment required by diminishing returns?"

Next, the farmer's financial way should be made as easy as possible. Farming of the right sort should be made attractive. Something is now being done in the way of extending credit. This will help matters, if properly handled. But the type of operation carried out by the Farm Loan Banks does not really get to the bottom of things. The true financial worry of the farmer comes from having to plant his maximum acreage from six months to a year before he receives his returns, without having any idea of the price he is to receive for his labor. He not only has to plant, but he has to plant pretty much the same crops as he planted the previous year, for proper farming means specialization. He is therefore between the upper and the nether millstones.

Now I am sure I can give no concrete remedy for this problem. It is too big and involved for offhand solution. Yet it must have a solution, even though it be somewhat imperfect, if the nation is going to make the most of its resources. Solutions should be worked out by experts, and Congress forced into line to try them out. Something can certainly be done to give the farmer a return for his products that is based on the cost of production, as in any other business; and that is all he asks.

As a beginning it would seem to be possible to increase the facilities for distribution, and to decrease the margin of profit between the producer and the ultimate consumer. There are necessary and legitimate charges for the transportation, storage, manufacture, and retail marketing of food. Whether the profits made by those who undertake these tasks is unreasonable or not is not at all clear from the available statistics. It is clear that the methods in use are unscientific and wasteful to an absurd degree, that they are needlessly involved and complicated, and that they are practically free from governmental supervision. The result is a price fluctuation governed by supply and demand, which works to the detriment of the public good. The farmer is affected first by any fall in prices through overproduction. He forthwith curtails too much, benefits a little by increased prices, and forces great hardship on the ultimate consumer. Any breakdown in the chain between the farmer and the consumer also reacts sharply and quickly against the latter, though the reaction ultimately reaches the producer.

The mechanism by which this muddle is to be clarified is for the future to reveal. It may be built up by government supervision, it may be evolved through the initiation of active co-operative marketing and buying; but whatever the general means to the end, the problem is one having several sharply defined phases.

1. Accurate and comprehensive agricultural statistics should be collected and made available quickly. With these facts as a basis the government should be able to keep its hand on the throttle of agricultural production, and should be able to prevent serious excess or deficiency in each crop subdivision. By similar advisory work, it should gradually be possible to have the food resources of the nation marketed more nearly continuously throughout the year. Both glut and scarcity might thus be avoided.

2. Transportation should be facilitated in every way consistent with industrial economy.

3. An analysis of the means and the costs by which food passes from producer to consumer should be made, with a system for more direct marketing and lessened middleman costs as the outcome. A markedly successful effort toward this end was made by the United States Food Administration during the war; so it is not a mere dream.

4. Deliberate speculative manipulation of food prices should be prohibited.

5. Hazards of buying and marketing on short-time contracts which are necessarily attended by somewhat of the speculative should be reduced to a minimum by whatever means is found adequate.

6. An agricultural foreign policy should be inaugurated which will have as its primary aim the stabilization of prices and the conservation of soil wealth.

With even a semblance of a solution to these important questions we shall have what we have not had before—an agricultural policy encouraging a continuous normal food production per capita with price fluctuations reduced to a minimum, simply through giving the farmer a square deal.

The final suggestion is forecasted by the arguments set forth earlier. In last analysis the future food-supply of the world depends upon the conservation of soil fertility. Our soil fertility is the greatest single asset of the nation, and it should not be permitted to be dissipated. The campaign for a truly permanent system of agriculture where productivity is kept high without soil robbery should not be allowed to lapse, but should be prosecuted more and more vigorously. Through proper rotation of crops, the return of waste products to the soil, and the use of our comparatively unlimited supply of fertilizers, this may be done. We do not want to wait until necessity presses us to adopt some of the methods of the Chinese.

For centuries the Chinese have utilized the waste products of human metabolism. It is a disagreeable thought to us, but it is a thought to which we must accustom ourselves. There is no other way to keep up productivity for a really extensive period as civilizations go. Hitherto, the stock-farming system has been recommended as involving the least waste of soil fertility. Grains were to be fed to the stock, and the manure of this stock returned to the land as fertilizer. But this system must pass. It is suitable only for a new country. In populous districts the beef animal must not compete with man for cereals. And as it passes, the tremendous engineering schemes for transporting the waste of human activity to the sea must also pass. The engineer must join forces with the farmer and evolve an innocuous system which will keep our soil assets intact for future generations. We who are passing along the great highway at the present moment of time are trustees for our descendants, not owners; and if we do not treat our trusteeship seriously and with due reverence, then we have no moral right to leave descendants.

Obviously this brief sketch of the agricultural situation of the United States in its relation to the population problem may be taken simply as a type illustration of what is going on everywhere in the world. The sparsely populated countries, like Argentina at present and the United States during the nineteenth century, have no pressing incentive to conserve the riches of the soil. They are used, without an accounting in the selling price, to provide food for over-populated countries; and thus improvidence is encouraged both at the producing end and at the consuming end. Meanwhile population density rises in the country of cheap agriculture because of this very fact. Economic pressure becomes higher, and, due to competition between those tilling virgin soils and those tilling soils giving decreasing returns, soil-fertility conservation becomes a subject of increased importance. It is no more important actually than it was at the beginning, but the conditions resulting from the greater requirements of a denser population finally force the recognition. The final stage is that now advertised to the world by China and Japan, where few products of mechanical industry are exchangeable for food, and where, therefore, the soil assets are preserved with assiduous care because no other course is possible. China and Japan are thus contemporary examples of what the world as a whole is coming to within a very short time. If, therefore, we in the United States would be forehanded, if we would show some capacity to anticipate difficulties in order to cope with them more easily, the just demand of agriculture to have intelligent consideration by the other half of us who are in different walks of life should be kept continuously on the front page of our memories. If we do not grasp the wisdom of aiding agricultural reconstruction to-day, may God pity those who follow.

At the same time the fact should not be overlooked that a permanent system of scientific agriculture, like the reforms which promise political and social justice, is merely a highly important factor in national progress. Desirable as it may be, it has not the essential, the indispensable, character of the factor whose importance we have emphasized so often already—population restriction. The finest and soundest agriculture in the world cannot keep a country from the depths of the most degrading misery, if it continues to pack its territory with human beings, without regard to whether there is room for them or not. Food production may reach the heights of efficiency and its distribution be well-nigh perfect, but if there is no end to the number of mouths to fill except as they are kept in check by positive agents of repression, we shall be in the same plight as were the daughters of Danaüs, forever carrying water in a sieve. The voices which demand 300 million people in the United States in order to make it secure and prosperous are Siren voices. If we listen, we are lost. What is needed is not 300 million people chained permanently to poverty and distress, but 150 million people, or thereabouts, who can live comfortably and happy if they will. If a sound government, an orderly society, a scientific agriculture can provide for only 150 or 200 million people adequately, the necessity supplemental to these other things is population restriction. Rational birth control is just as much a fundamental need of the nation as conservation of resources, equitable laws, and healthy social customs. It is even more; it is the keystone which must hold the others in place. One must admit that in the olden days there was distress in underpopulated countries through the indecency of man to his fellow man; there is distress even to-day from the same cause. But these causes of discomfort are easily remedied, and are being remedied. In this, democracy shows progress, in spite of what communists would have us believe. If, however, overpopulation is to be inevitable because man will put no rational restriction to his natural fecundity, then these extraneous social reforms are of no avail. To make this type of improvement more than a temporary loophole of escape, there must be a standardized, stationary population far below the maximum which it would be humanly possible to support under squalid conditions which carry in their train only sorrow and desolation. And if this goal is to be reached within the limit of time at our disposal before it is too late—some 50 years at most—there must be a radical drop in the birth-rate; but this must not be accomplished by a further drop to the zero-point of the birth-rate of those best endowed to build a better nation, it must be through family limitation national in scope, taught by the physician, the social worker, and the trained nurse, as a measure of public necessity, of domestic happiness, and of economic expedience.

CHAPTER VII

THE RÔLE OF DEATH IN THE DRAMA OF LIFE

Few individuals, unless they are saturated with the philosophy of Gautama Buddha, can disguise their interest in the length of life. One may become almost as popular as a star of the celluloid-film persuasion by founding a society designed to aid in prolonging our great adventure. Devotees will flock to the standard. They will exercise or rest, diet or drink buttermilk à la Metchnikoff, adopt a clothing fad or return to nature, if led to expect a few more years in which to nurse the memories of youth. But in spite of our desires and hopes and efforts, there is no evidence whatever that man is approaching that interesting state of long-extended existence pictured so cleverly in Shaw's delightful satire *Back to Methusaleh.* No, man is an ephemeral organism; as a flower of the field so he flourisheth.

The extreme of natural life is slightly over 100 years. There is no reason for believing it was greater in the past; presumably it will be no greater in the future. To be sure, claims of advanced age are by no means rare. Pearl[1] found 649 deaths registered as of ages 100 or over in a total mortality of about a million recorded for the United States in 1916. But most of these records are undoubtedly erroneous. They occur because so many poor humdrum creatures of 80 or 90 suddenly lift themselves to a certain pinnacle of fame by claiming to be centenarians. In itself this is a harmless overcompensation, no more to be censured than the fables of childhood; but in a serious study of age limits one must not be misled. As to the facts, we may accept the conclusions of Young,[1] since he is the only investigator who has enquired carefully into the subject. Young was able to authenticate only thirty centenarians in a British life-insurance experience involving somewhat under a million deaths. The extreme was a woman who lacked but six weeks of reaching her one hundred and eleventh birthday. There is a way of checking Young's results. If one examines the life-tables of various European countries in graphical form, a great similarity is found at the major extremes. The different countries, which are to a considerable extent made up of diverse ethnical groups, may vary markedly in the frequency of death at early ages or even at comparatively late ages; but when a smooth curve is fitted, the end point is nearly the same in every instance. The extreme of life for the various subdivisions of the white race is thus established at slightly over 100 years, and there is every reason for believing it to be no greater in the other primary races.

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[1] Pearl, R., *The Biology of Death.* Phila.: Lippincott, 1922. This book has been the chief source of material for the present chapter.

To many of us the contemplation of death, even at the end of a hundred years, is always sad; but this is the narrow subjective emotionalism of the individual reacting against past loss of companionship and presumptive unknown changes. Science has given the world a conception of death full of nobility and beauty. Death was the price exacted in return for the gift of body and of mind, for power to think and will to do, for joy and sorrow and hope and desire, for consciousness instead of mere existence. Death came that life might be worth living. The little one-celled animalculæ one may pick up by the thousands in a pailful of pond water do not die. They grow and divide, grow and divide, and so on and on forever, if they find food and warmth and moisture. Even the individual cells of our own bodies are potentially immortal. From the experiments of Loeb, of Harrison and of Carrel one can draw no other conclusion.

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[1] Young, J. E., *On Centenarians.* London, 1905.

The various tissues of the body can be kept growing in artificial cultures month after month, year after year. But what a life—cell division in a glass jar.

Life, therefore, is inherently continuous, and death the price of differentiation. Death is an attribute only of a complex body as a whole, because in this complex body the organs have come to be dependent on each other. Natural death occurs normally and necessarily only in a body composed of many cells, and then only when that body has lost the power, functionally or mechanically, of regenerating itself from any part. Death approaches threateningly any time there is a breakdown of an essential organ system, and descends speedily if repair is not quickly made; it comes at last inexorably simply because the business of living finally slows down and clogs the machine with poisonous waste produced by its own activity.

This view, as Pearl has pointed out, is in certain respects at one with Christian theology. "In the view of the Church," he says, "death is a consequence of sin, and prior to the advent of sin, living things were in order to continue indefinitely in the enjoyment of life." "What the theologian calls sin the biologist calls differentiation," and in this parallel there lurks a moral, for "all too frequently in man's sad history here below the different has been regarded as sinful." But let us not pursue this thought further. We bartered our bodily immortality long, long ago, and obtained the best of the bargain. One would rather be a man, the poorest and most abject sort of a man, than an amœba. We have accepted inevitable death in return for increased freedom of life; let us concern ourselves with some of the matters connected with the time of final payment.

What one actually finds when one follows the life histories of a large number of infants—say, 100,000—starting along life's pathway together is pictured in Figure 9, a life-table based on United States experience and thus a fairly good random sample of several racial groups. The line L gives the number of persons surviving at the end of one year, while the line D shows the deaths recorded annually.

The period of infancy takes a terrible toll; at the end of the first year over one-tenth of the entrants to the race have fallen by the way. Then comes a time up to about 40 years of age when the hand of death is laid more lightly on the survivors. At that age 70,000 of the original 100,000 still remain. From there the life-line drops with increasing speed until about the age of 80, when it once more takes a change of direction marking the slow passage of the last tithe of those who started so long ago down the great highway.

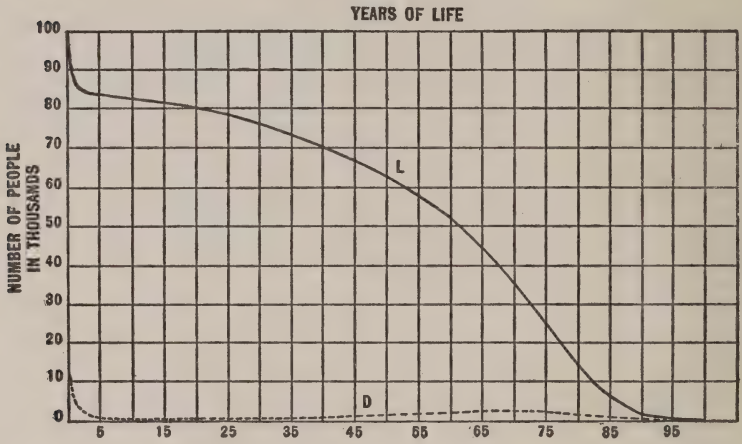

FIG. 9. LIFE-TABLE DIAGRAM, UNITED STATES, 1910. (AFTER PEARL FROM GLOVER.)

L—Survivors from 100,000 born alive. D—Annual deaths.

The final points of life-tables such as this seem to be about the same, not only for different racial groups but for different periods of time. From Pearson's and Macdonell's data on Egyptian mummies of approximately 2,000 years ago, from seventeenth-century Breslau, from eighteenth-century England, and from the numerous tables for the nineteenth century based on data from all over the white world, one is driven to the same conclusion. There is no trend toward a longer span.

But when one examines these tables with the view of comparing the expectation of life at different ages there is another story. Figure 10 tells us this story graphically. Here is the expectation of life for the United States in 1910,

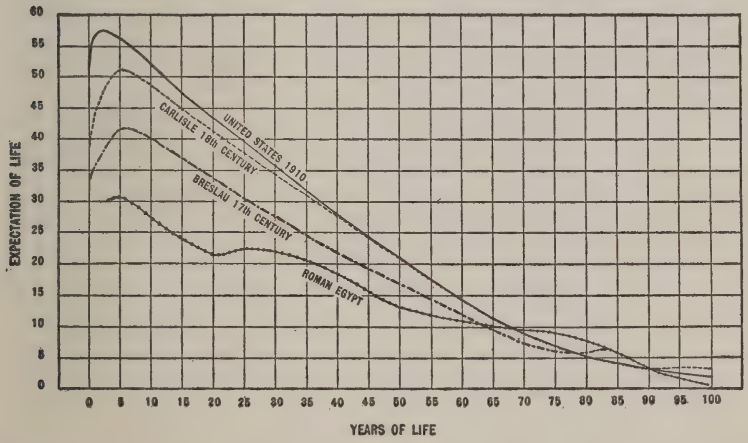

FIG. 10. THE CHANGING EXPECTATION OF LIFE. (BASED ON DATA COMPILED BY PEARL FROM VARIOUS SOURCES.)

and in the same diagram are the expectations which Pearson and Macdonell found for Roman Egypt, the expectations of Halley's Breslau table comprising the years 1687 to 1691, and the expectations of Milne's English table from data for the years 1780 to 1787. *The mummy records are fragmentary, and those from the seventeenth and eighteenth centuries are not so complete and accurate as those for present-day United States; nevertheless, these tables bear striking evidence that at all early ages the expectation of life is greater now than it has been in the past.* The expectation of life for the aged is just the reverse. The man of 70 or 80 cannot now expect to live as long as did one of similar age in the long ago. Odd as this may seem, it is just what the statistician would predict.

In the olden days when the young met more buffets from outrageous fortune, when it was a real feat to dodge the scythe of Time till the ripe old age of 40, he was indeed a rugged and tough individual who reached his threescore years and ten. By this same token, the rigidity of the selection through which he passed, he might expect a further period of escape from the grim reaper which cannot be counted on by his modern cotype who has been more or less miraculously preserved by medical attention and sanitation.

It is rather an odd thing that when these expectation-of-life tables are broken up and presented as separate exhibits for the two sexes, the present-day female has better prospects than the male for practically all ages. But exactly the opposite appears to be true when one examines Macdonell's data for citizens of Rome during the third and fourth centuries of the Christian era. Owing to the fragmentary character of the Roman records it is not certain whether this is significant, but Macdonell believes it shows that definite factors affecting female health adversely were then at work which have now been overcome.

One has only to study the data from which these life-tables are constructed, the tables of causes of death, to be convinced that man is not like the one-horse shay. His various organs do not have the same efficiency. And Pearl[1] has brought forward a great many facts tending to show that this difference in efficiency has a group association with the embryological substratum from which the organs came. He puts the difference on an evolutionary basis. Those organs, he maintains, which have evolved the least during the course of evolution, for example the alimentary tract, are those which break down the most frequently. On the other hand, that part of the embryonic structure which has shown the highest degree of adaptability and therefore is marked by the greatest amount of specialization, such as the ectoderm, which has given rise to the skin and central nervous system, shows the greatest ability to withstand the vicissitudes of fortune during life.

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[1] Pearl, R., "On the Embryological Basis of Human Mortality Rates," *Proc. Nat. Acad. Sci.*, 5 : 593–598, 1919.

As our own interest in death-rates lies chiefly in the effect that past, present, and prospective changes have on the population question, I should like to present Doctor Pearl's results in a little more detail, because he treats the matter in a consistent logical way. He[1] has rearranged the International Classification of causes of death by grouping together all functional disturbances of the same general organ system. His ten headings are as follows:

I. Circulatory system, blood and blood-forming organs.
II. Respiratory system.
III. Primary and secondary sex organs.
IV. Kidneys and related excretory organs.
V. Skeletal and muscular systems.
VI. Alimentary tract and associate organs concerned in metabolism.
VII. Nervous system and sense organs.
VIII. Skin.
IX. Endocrinal system.
X. All other causes of death.

The last one is a junk-shop, of course, but it does not contain such a heterogeneous collection of odds and ends as the "General Diseases" of the International System.

Statistics on these grouped causes of death were studied for three different localities, viz., the United States registration area between 1906 and 1910, England and Wales in 1914, and the city of São Paulo, Brazil, in 1917, with the results summarized graphically in Figure 11.

The findings are rather astonishing in their co-ordination.

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[1] Pearl, R., "A Biological Classification of the Causes of Death," *Metron.*, 1 : 92–99, 1921.

With the exception of the high death-rate in São Paulo from diseases of the alimentary tract due to an enormous number of infant deaths from diarrhœa and enteritis, and some inversions of order where the sex organs and the kidneys are

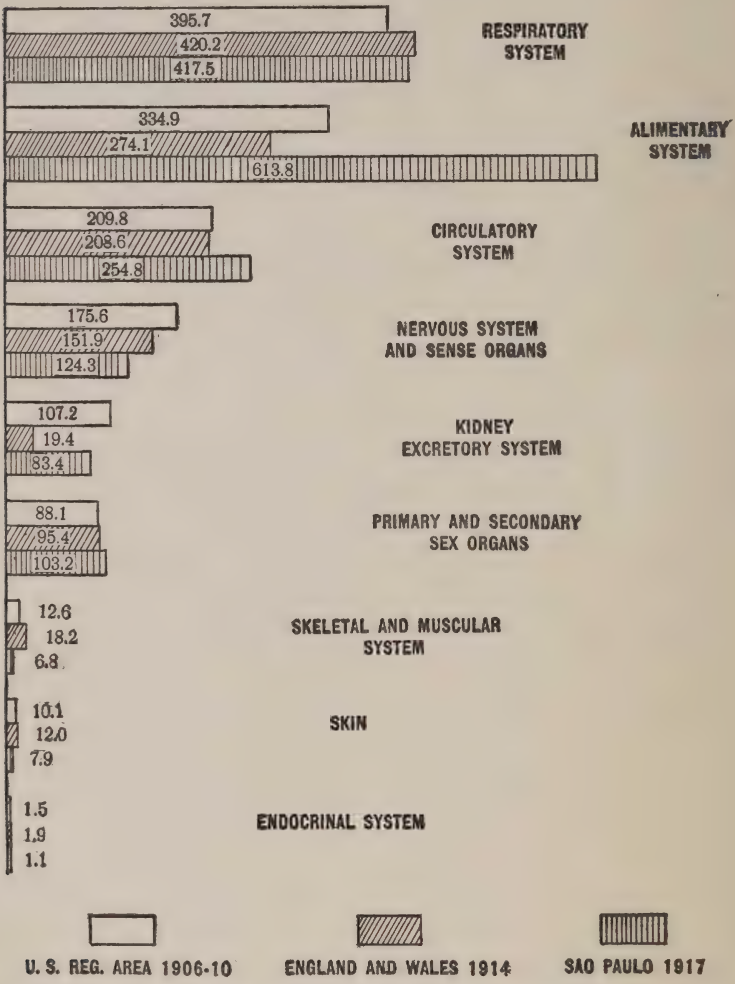

FIG. 11. THE RELATIVE IMPORTANCE OF THE DIFFERENT ORGAN SYSTEMS IN HUMAN MORTALITY. (PEARL'S DATA.)

concerned because of false reports, relative efficiency of the various organ groups in these three places is about the same.

Diseases of the respiratory system clearly come first, and diseases of the alimentary tract second. Together they account for more than half of the classifiable deaths. This is not odd. The skin, which causes relatively few deaths, has developed great powers of resistance to outside enemies because of its ideal protective layers. But the other two organ systems coming in contact with the noxious flora of air, water, and food, on account of their more complex functions are less well provided with systems of defense, hence they give way more frequently. Pearl[1] expresses the comparison between these systems and the circulatory system thus picturesquely:

> The organs concerned with the blood and its circulation—the heart, the arteries and veins—stand third in importance in the mortality list. Biologically the blood, through its immunological mechanism, constitutes the second line of defense which the body has against noxious invaders. The first line is the resistance of the outer cells of the skin and the lining epithelium of alimentary tract, lungs, and sexual and excretory organs. When invading organisms pass or break down these first two lines of defense, the battle is then with the home guard, the cells of the organ system itself, which, like the industrial workers of a commonwealth, keep the body going as a whole functioning mechanism. Naturally it would be expected that the casualties would be far heavier in the first two defense lines (respiratory and alimentary systems and the blood and circulation) than in the home guard. Death-rates when biologically classified bear out this expectation.

There is a great deal to be learned from this statistical presentation of causes of death, beyond the mere fact that the body is a complex machine consisting of many intricate interlocking parts any one of which may cease to function and thus upset the orderly working together of the whole system. There is first the picture of the body as a machine made of different materials of unequal worth, a flimsy alimentary tract and lungs, a mediocre heart, and a high-grade brain. As Pearl[1] says:

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[1] Pearl, R., *The Biology of Death*, p. 111.

> Evolution by the haphazard process of trial and error which we call natural selection, makes each part only just good enough to get by. In the very nature of the process itself it cannot possibly do anything any more constructive than this. The workmanship of evolution, from a mechanical point of view, is extraordinarily like that of the average automobile repair man. If evolution happens to be furnished with fine materials, as in the case of the nervous system, it has no objection to using them, but it is equally ready to use the shoddiest of endoderm provided it will hold together long enough to get the machine by the reproductive period.

This shows clearly where medical opportunity lies in bolstering up the weaknesses of nature; and it appears to indicate a further value to medical effort not wholly obvious. There is a weak digestive system, for example, which does not gain its full strength for resisting the invasion of bacterial battalions until about the seventh year. If proper hygienic and sanitary measures can tide a child over these few years of high susceptibility, therefore, one may rest assured that the chances are good that the remaining organs are sufficiently well built to keep the machine running for some considerable time. In other words, we are not such altogether poor mechanisms that every part has to be continually tinkered with and tuned up, rather are we pieces of generally fine workmanship with one or two delicate parts which ought to be looked to now and then. If this is done the operating time can be prolonged materially.

Second, this evidence is additional proof of the immensely important part played by innate hereditary factors in determining human mortality rates, since the similar results for the United States, England and Wales, and São Paulo in southern Brazil were for people living under dissimilar environments.

There are other data on this phase of the subject going far to show that much the best way to attain longevity is to select long-lived fathers and mothers. One of the simplest instances of an investigation of this sort is Alexander Graham Bell's[1] study of the influence of parental age at death on the length of life of their offspring, from the genealogical records of the Hyde family. The results are based upon nearly 2,300 cases, and therefore may be accepted with a high degree of confidence. One example will illustrate the way the work was done, and at the same time present a typical sample of the conclusions. Where neither parent lived to be 80, only 5.3 per cent of the offspring reached that age; where one parent lived to be 80, 9.8 per cent of the offspring reached that point or older; where both parents attained their 80th birthday, 20.6 per cent of the offspring arrived at the same great age.

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[1] *l. c.*, p. 148.

Much more extended and more precise studies of the same character have been carried out by Karl Pearson and his associates at the Francis Galton Eugenics Laboratory in London. Pearson has built up a refined mathematical treatment by which the association between parents and offspring for any character—such as age at death—can be reduced to a single arithmetical term, a fraction. This means that if the age of the parents at death has no effect on the age at death of the children, because of no hereditary influence, this measure of correlation will be zero. If heredity does exert a measurable influence on the time of death, determinations from actual data will show a fraction somewhere between zero and one. The average correlation between parents and adult children in respect to duration of life Pearson found to be .1365. This figure will not mean a great deal, however, without something tangible with which to compare it, such as the same measure of association for physical characters known to be inherited. Fortunately Pearson has made a great many such computations from all sorts of physical measurements, and the resulting average is .4675. Here then is a figure, a kind of yardstick of heredity, for characters which are only slightly affected by differences in environment, with which to compare the figure obtained for duration of life where it is admitted that all kinds of accidental circumstances come into play. From these two figures, by a method that Pearson has devised, it is possible to determine roughly the part played by heredity and the part played by other factors in the death-rate. After making such a comparison, Pearson reached the conclusion that from 50 to 75 per cent of the general death-rate is determined solely by the forces of heredity and is not susceptible of modification by any measures of sanitation or preventive medicine.

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[1] Bell, A. G., *The Duration of Life and Conditions Associated with Longevity. A Study of the Hyde Genealogy.* Washington, privately printed, 1918.

Our interest in this matter here is twofold: in the first place, the investigation gives a rough general idea of the huge effect of heredity on the death-rate under conditions of poverty, disease, and general economic stress that are relatively good, and sets a maximum beyond which medical effort cannot pass. In the second place, it establishes the fact that the death-rate must be selective, for if duration of life is in part determined by inherent qualities, it follows that those with innately weak constitutions will on the average die before the others. The latter point is one of great importance to sociologists, since any such selective elimination before the termination of the reproductive period is certain to tend toward the establishment of a sounder and more vigorous race. And not only is the fact established, but the amount of the selection has actually been measured.

There is little to be gained by examining in detail the methods by which this result was obtained, or the meaning of the numerical values obtained; the broad conclusions can be accepted without hesitation because of the inclusiveness of the investigations, the heterogeneity of the data treated, and the competence of the investigators. The first analysis was made by Beeton and Pearson[1] from statistics found in the *Peerage* and the *Landed Gentry*, and the second by the same workers from the records of the Society of Friends. The statistical constants obtained were of the same order of magnitude. They were confirmed by Ploetz[2] in Germany and by Snow[3] in England from data on the general population of rural districts. They have again been confirmed more recently in an extended investigation conducted by Crum and Fisher[4] on excellent Dutch vital statistics involving a million and a half births.

Thus there are valuable data from selected groups where children received every possible care, from groups where care was moderate, and from groups where neglect was in evidence, from cities and from rural districts, all pointing to the fact that natural infant mortality effects an elimination of the constitutionally unfit. Successful efforts to lower infant mortality will result in a somewhat higher child mortality; nevertheless, lowered death-rates of infants and children and young mothers will eventually bring past the reproductive age many weaklings who would otherwise have left no offspring. In other words, increased medical skill and the spread of preventive methods will tend to result in a race weaker naturally than before. There is no reason for blinding oneself to consequences; the facts of heredity must be faced in every attempt to save the babies and children. Nothing is to be gained by acting as if they did not exist.

We have chosen our course; we have put our hands to the plough and shall turn the furrow to the end. We shall circumvent this sort of natural selection by every means known to science now and hereafter; but it is just as well to view the problem with that breadth of vision which will differentiate between the privilege of survival and the privilege of reproduction. It seems to me that no one can possibly be antagonistic toward any sound health measure directed toward prolonging the life of every one whose existence is helpful to society, but it also seems perfectly clear that society has the right to advise against procreation and even to prevent it at times forcibly among those individuals in which continued propagation seriously tends to impair the social stamina. Prevention ought to begin with the definitely feeble-minded; where it should end can be determined later. In saying this, I hope the reader will not obtain the idea that I am assenting to any radical type of propaganda, such as the newspaper cartoonists portray, where prospective parents are selected only from great pigeon-breasted, heavy-muscled animals whose only place in world activities would seem to be in acting as human trucks. This is not the case at all. Only in extraordinary circumstances, such as with the feeble-minded, has society any present call to interfere forcibly with procreation; but it certainly has the same legal and moral right to interfere here that it has in the case of extramarital procreation—which has been accepted as just and proper—and with a great deal more biological justification. The cause which I favor is such education along these lines as will enable the individual to select his or her mate with a reasonable degree of certainty that their children will be sound and healthy.

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[1] Beeton, M., and Pearson, K. See *Proc. Roy. Soc.*, 65 : 290–305, 1899. And, *Biometrika*, 1 : 50–89, 1901.

[2] Ploetz, A., "Lebensdauer der Eltern und Kindersterblichkeit," *Arch. f. Rassen- und Gesell-Biologie*, 6 : 33–43, 1909.

[3] Snow, E. C., *The Intensity of Natural Selection in Man.* Draper's Company Memoirs, 1911.

[4] Crum, F. S., "The Effect of Infant Mortality on the After Lifetime of Survivors." *Trans. 11th Ann. Mtg. Amer. Child. Hyg. Assn.*, 1920.

Let us now turn the page and centre our attentions on the struggle to reduce accidental death. Human beings are somewhat like clocks wound up for particular periods of sixty, eighty, or a hundred years, and the time they will run naturally cannot be lengthened by changing their surroundings; but something can be done to prevent premature stoppage from sand in the gears. While we are examining the prospects along these lines we shall also have the opportunity of looking into the question of whether sanitary, hygienic, and public-health measures are designed to carry the human race on the downward path, through reversing natural selection, as fast as some neo-darwinians are prone to think.

There is no doubt of a continuously decreasing death-rate at the early ages; the changes in the curves of expectation of life in successive periods, as is shown in Figure 10, bring this point out clearly and in the best possible manner. The usual method of endeavoring to prove this point is by citing tables of changes in the crude rate of death per thousand of the population, and this is the worst possible way. I mention this as an apology for not presenting a long series of such tables, should any reader have been expecting them. This is the worst possible way because death-rates mean almost nothing unless corrected to a *standard* population in which the proportion of persons of each age is assumed to be constant. Otherwise it is obvious that in a healthy population where a lot of old people were left because of emigration, the death-rate would appear very high; while the country to which these vigorous young people went would show a comparatively low death-rate, no matter what the existing conditions. Fortunately one can obtain corrected data made into life-tables by James W. Glover for the Bureau of the Census from the vital statistics of the original registration States—the New England States, New York, New Jersey, Michigan, Indiana, and the District of Columbia. One can also obtain similar data for a good many of the European countries and their colonies. From such evidence the unqualified statement can be made that in general the mortality rate at early ages is going down. At late ages it remains about the same, although occasionally a rise is shown.

In our original registration States the annual mortality rate per thousand at birth was 133.45 in 1901 and 123.26 in 1910 for white males; and 110.61 in 1901 and 102.26 in

1910 for females. For males a marked but smaller difference in favor of 1910 is shown until the age of 42; from there until the age of 55 the curves remain about the same; then the lines turn in favor of 1901 until very late in life. The same thing happens in the case of females, except that the mortality rates of the later date are lower up to the age 57. Clearly one of two things must have happened, either there is a compensatory higher mortality at late ages of the feebler individuals saved earlier, or there is actual increase in the diseases of old age offsetting the progress in combating the diseases of infancy and childhood.

The mortality of the negroes of the same area has followed a similar course. It was much higher than for the general population and naturally had a greater opportunity to fall. It had the figures for males at birth of 253.26 in 1901 and 219.35 in 1910; and for females of 214.75 in 1901 and 185.07 in 1910. The noteworthy feature of the negro mortality curve is the fact that the gains of the early ages in the case of males are much more nearly offset by the retardation at later ages than in the case of the white. The male mortality rate of 1910 passes that of 1901 at age 20, falls behind at age 22, then passes ahead at age 28, and stays definitely ahead until age 80. The female curves for the two periods show much crossing and recrossing, with no great difference on the whole.

When the above tables are separated into urban and rural districts, the rural districts show consistently lower mortality rates. The rates for white males follow; the general trend of the female rates was similar.

I am inclined to see a marked difference in physical stamina due to race in these mortality rates favoring the rural population. The rural districts even in New England are still preponderantly Nordic, the percentage probably being as high as 85; but in the city population from which these data are taken, aliens from eastern and southern Europe form the majority. Of course the joker would say that fresh air and the absence of medical attention has made the difference.

MORTALITY RATES IN THE UNITED STATES FOR WHITE MALES IN URBAN AND IN RURAL POPULATIONS

	At birth	Age 10	Age 20	Age 40	Age 60
Urban, 1901	150.97	2.97	6.29	13.54	38.15
Rural, 1901	109.00	2.29	5.04	7.13	21.68
Difference	41.97	0.68	1.25	6.41	16.47
Urban, 1910	133.80	2.59	4.93	12.10	38.51
Rural, 1910	103.26	2.07	4.83	7.06	22.91
Difference	30.54	0.52	0.10	5.04	15.60

The complete expectation of life at various ages for several important countries is given in the following table. It is based on the official figures for each country as computed by Doctor Glover.

These life expectations mean that, on the average, individuals alive at any given age have the number of years to live stated in the column for that age. They show that the United States is not a leader in general hygienic measures and hereditary longevity by any means. The palm for high expectation of life at birth must be given to Australia; but such is the peculiar trend of mortal affairs, she loses this place immediately to Denmark, which surpasses her at all later ages. Indeed, the grand prize for general healthfulness must go to the Scandinavian countries, though Holland follows closely. They have high expectation of life at all ages. The United States, England, and Germany form another group perhaps, then Italy and Japan, and finally India.

A careful study of this table gives one also a fair idea of the general trend of the death-rates in the various countries, and especially of the effect of elimination at various ages. All countries exhibit the same phenomenon; the greatest

EXPECTATION OF LIFE IN YEARS

Males above, females below

Country	At birth	Age 10	Age 20	Age 30	Age 40	Age 60	Age 80
Australia, 1901–10...	55.20	53.53	44.74	36.52	28.56	14.35	4.96
	58.84	56.39	47.52	39.33	31.47	16.20	5.73
Denmark, 1906–10..	54.90	55.10	46.30	38.00	29.70	15.20	5.10
	57.90	56.70	48.20	40.10	32.00	16.50	5.50
England, 1901–10...	48.53	51.81	43.01	34.76	26.96	13.49	4.86
	52.38	54.53	45.77	37.36	29.37	15.01	5.36
France, 1898–1903 ..	45.74	49.75	41.53	34.35	27.15	13.81	4.87
	49.13	52.03	44.02	36.93	29.60	15.08	5.38
Germany, 1901–10..	44.82	51.16	42.56	34.55	26.64	13.14	4.38
	48.33	53.35	44.84	36.94	29.16	14.17	4.65
Holland, 1900–9....	51.00	54.30	45.70	37.80	29.50	14.70	4.90
	53.40	55.40	46.90	38.80	30.80	15.50	5.20
India, 1901–10......	22.59	33.36	27.46	22.44	18.02	10.00	3.04
	23.31	33.74	27.96	22.99	18.49	10.11	3.06
Italy, 1901–10......	44.24	51.44	43.27	35.94	28.23	13.78	4.06
	44.83	51.33	43.69	36.58	29.18	14.02	4.11
Japan, 1898–1903...	43.97	48.23	40.35	33.44	26.03	12.76	4.44
	44.85	48.34	41.06	34.84	28.19	14.32	4.85
Norway, 1901–10...	54.84	52.92	45.16	38.86	31.49	16.79	5.86
	57.72	55.09	47.35	40.24	32.93	17.85	6.29
Sweden, 1901–10....	54.53	54.03	45.88	38.57	30.77	16.06	5.22
	56.98	55.58	47.66	40.20	32.53	17.19	5.64
Switzerland, 1901–10	49.25	50.34	41.70	33.80	26.03	12.73	4.27
	52.15	51.98	43.69	36.10	28.43	13.67	4.51
United States, 1901–10[1].........	49.32	50.86	42.39	34.80	27.55	14.17	5.07
	52.54	52.89	44.39	36.75	29.28	15.09	5.43

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[1] Original registration States,—New England States, New York, New Jersey, Indiana, Michigan, and District of Columbia.

chance for improvement lies in the early years; and in all of the statistics comparing different recent periods which I have had the opportunity to examine, this is where the change for the better is occurring.

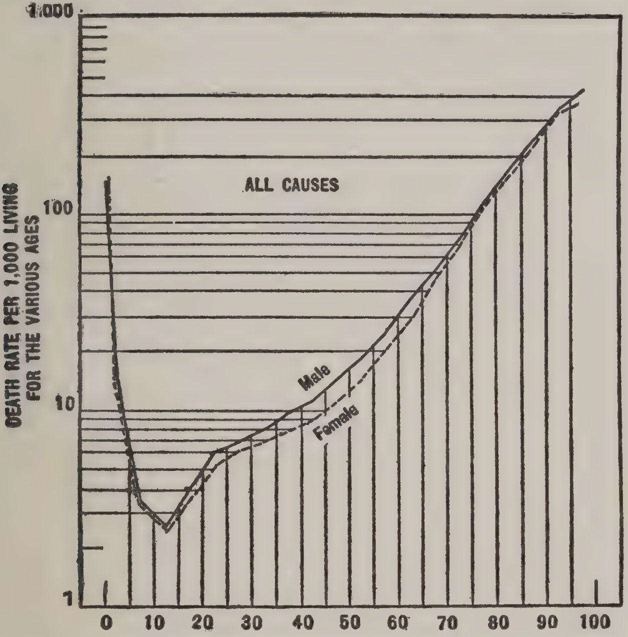

Fig. 12. DEATH-RATES AT EACH AGE FROM ALL CAUSES IN U. S. REG. AREA, 1910, EXCLUSIVE OF NORTH CAROLINA.
Logarithmic scale permits comparison of rates (Redrawn from Pearl.)

Now if one turns to Pearl's work on the most fatal organ systems at different ages, from data for 1910 gathered in the United States registration area exclusive of North Carolina, he finds that diseases of the alimentary tract account for 68.8 per cent of all infant mortality in the male and 40.6 per cent in the female. After the first year of life respiratory affections take the lead and hold it until age 50 in both sexes. For the next ten years the female is again troubled with diseases of the alimentary tract, though this is not true in the male. Thereafter in both sexes death comes most frequently by breakdown of the circulatory system.

Let us examine some of these data. Figure 12 gives a graphic picture of the death-rates of each sex at the various ages from all causes taken together. It is plotted vertically

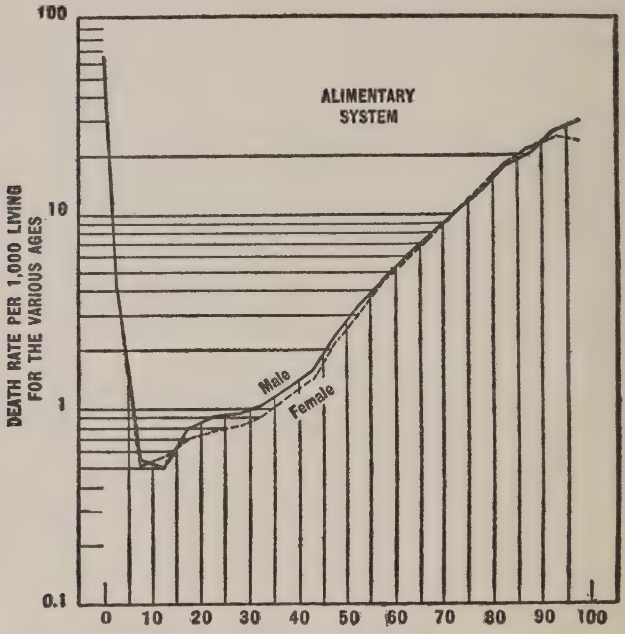

FIG. 13. DEATH-RATES AT EACH AGE FROM AFFECTIONS OF THE ALIMENTARY SYSTEM, U. S. REG. AREA, 1910, EXCLUSIVE OF NORTH CAROLINA. (REDRAWN FROM PEARL.)

on a logarithmic scale, because this scale enables one to make a direct comparison of *rates* of change. A straight line forming an angle with the horizontal on a logarithmic scale means that the variable is changing at a constant rate.

During the first year death falls with a heavier hand on the girls. Out of each thousand females 143 die; out of each thousand males 124 die. Thereafter throughout the whole term of existence the total force of mortality weighs more heavily on the males. The low point is at the time of puberty, thus showing how nature provided for reproduction; from then until about the age of 25 there is a relatively rapid rise. From this point until well along in middle life the rate shows a slower and more constant rise.

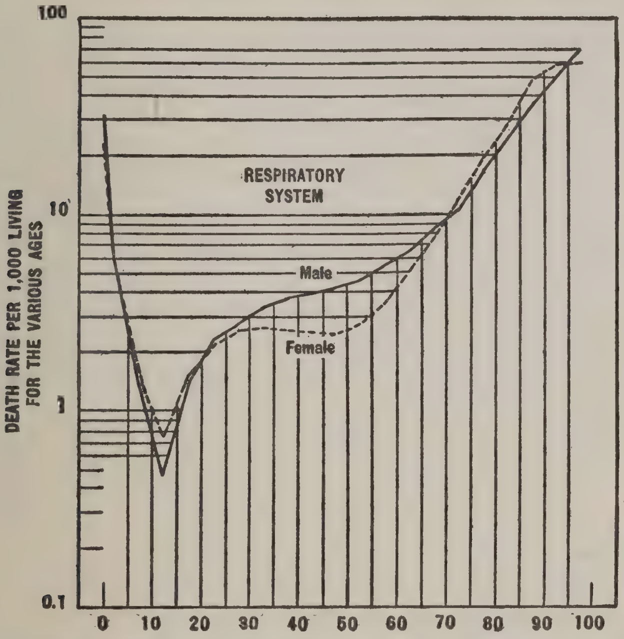

FIG. 14. DEATH-RATES AT EACH AGE FROM BREAKDOWN OF THE RESPIRATORY SYSTEM, U. S. REG. AREA, 1910, EXCLUSIVE OF NORTH CAROLINA. (REDRAWN FROM PEARL.)

The next three diagrams plotted on the same scale show specific rates of death for each sex over the same period and covering the same geographical area for some of the important organ systems. Figure 13 is for the alimentary tract and the other organs associated in metabolism. Here one sees the tremendous toll taken of the young in both sexes. The rate falls more speedily than for any other group, reaching a point almost at the minimum at about seven years of age. It falls so rapidly that one can hardly appreciate how very early the serious exposure to risk is passed. Diarrhœa and enteritis, above all other diseases, are the fearsome pestilences of infancy. After the period of adolescence, the death-rate from these troubles rises sharply in the male until full

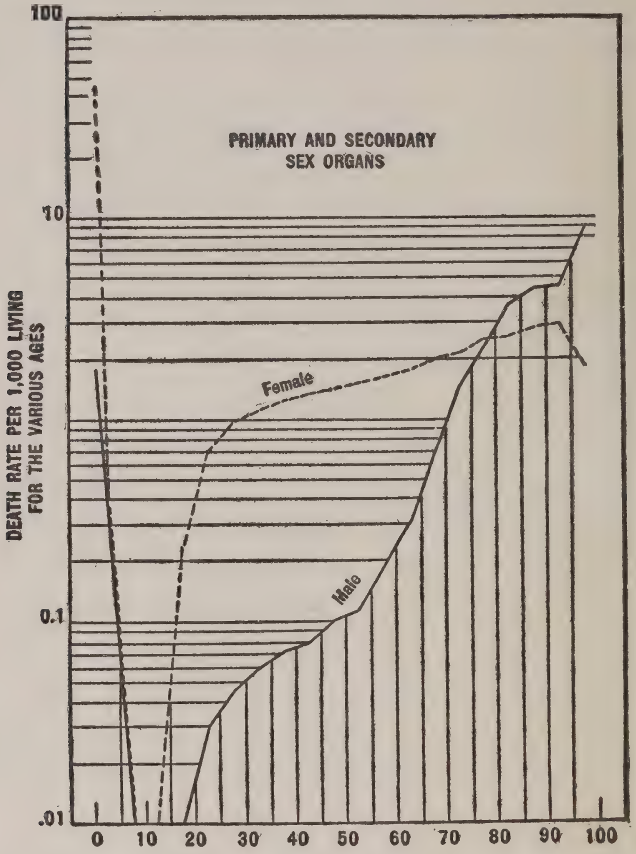

FIG. 15. DEATH-RATES AT EACH AGE FROM BREAKDOWN OF THE PRIMARY AND SECONDARY SEX ORGANS, U. S. REG. AREA, 1910, EXCLUSIVE OF NORTH CAROLINA. (REDRAWN FROM PEARL.)

physical maturity, and then more slowly until middle age. In the female there is little tendency toward a sudden rise at maturity, merely a gradual increase in the rate from adolescence to old age.

The diseases of the respiratory system, as shown in Figure 14, show a similar high rate for babies of both sexes. There is a sharp drop through childhood with the low point in each sex reached at puberty, when the force of mortality is less than one per thousand of those exposed to risk. At this point the adolescent girls show a significantly higher rate than the boys, but throughout the years of middle age and early old age the opposite is true. Presumably this latter is the result of the greater exposure to risk and the heavier demand on the respiratory organs of the male due to his activity in the necessary business of making a living.

The next pair of mortality curves, shown in Figure 15, result from the breakdown of primary and secondary sex organs. It is first to be noted that there is a tremendous infantile mortality. This is not due, of course, to breakdown of the sex organs of the infants themselves but rather to the fact that the sex organs of the mother are not able to withstand the strain due to child-bearing, hence resulting in premature birth or death of the children at birth. As Pearl says: "It is obvious enough that the infants whose deaths are recorded under these heads in the vast majority of cases, if not all, have nothing whatever the matter with either their primary or secondary sex organs." Nevertheless, it is apparent that premature births occur because the reproductive system of the mother is not equal to the stress of carrying the child to full term, or fails to function normally at time of birth.

The sex organs give little trouble through childhood, but then come the exposures of mothers to risk throughout the reproductive period. This accounts for the marked rise in the female death-rate as compared to the male. The male mortality line does not cross that of the female until about the seventy-eighth year of life, which is the time when the mortality from prostatic troubles begins to show a relatively high toll. It is interesting in this connection that the only other organ system showing a relatively greater weakness in women than in men along through middle life is that of the kidneys and excretory organs. Manifestly this is again a weakness attributable to the heavy demands made by reproduction.

It is clear then that the great opportunity for retarding death-rates lies in the control of diseases of the alimentary tract and the respiratory system, and that this opportunity bulks greatest in infancy and childhood. The next best chance of increasing expectation of life concerns the mother. It is a black, black mark on the record of medical effort that there should be an annual toll of 16,000 women in the United States through the exercise of a normal function, and that the death-rate has hardly changed in twenty years, even though puerperal fever has almost been abolished. There can be no better slogan for preventive medicine than "Save the women and children."

Public-health work has indeed been largely directed toward combating diseases of the respiratory system and the alimentary tract, and it has had its effect. Pearl found, on studying the records of the two five-year periods 1901–1905 and 1906–1910, that there had been a drop of 14 per cent in the death-rate from tuberculosis of the lungs, lobar pneumonia, and bronchitis; and a drop of 18 per cent in diseases of the digestive system. It is somewhat astonishing that the death-rate for the second group of diseases has not dropped lower than it has, when one considers the practical elimination of typhoid fever; but to offset this gain there has been an increase in infantile diarrhœa and enteritis, congenital debility and cancer.

The diseases of many of the other organs seem less easily controllable. The death-rates from breakdowns of skeletal and muscular systems, from affections of the skin, and from the glands of the endocrinal system, however, are practically negligible; and even those diseases chargeable to weaknesses of the nervous systems and sense-organs are by no means high. These organs are made of pretty high-grade materials and are built for their jobs in a thoroughly workmanlike manner. The diseases of the circulatory system are of a graver nature. After the age 25 they take a rapidly increasing number of lives in both sexes. The whole system is under great continuous strain, and simply wears out at an earlier or later period.

Progress in medicine and in surgery can be shown in other ways than by studying death-rates. If one wishes to know exactly what is going on in the application of medical knowledge, statistical treatment of specific death-rates is the only way, but this only tells him how wide-spread and how successful application of knowledge has been. Any one who has the slightest knowledge of the history of modern medicine, however, knows that one cannot obtain an exact knowledge of medical opportunity by this method. It is common knowledge that typhoid fever is wholly controllable, for example; still the death-rate over the United States from typhoid fever remains over ten per thousand deaths annually. Inquiry into the state of medical research is necessary, therefore, if one is to have a clear idea of the present outlook.

Roughly, medical advance in order of its probable significance can be divided into four headings: general sanitation, serum treatment, prevention of infection, and surgery. What the older generation deemed the foundation of disease treatment, internal medication, has not advanced materially,[1] unless one calls it an advance—as indeed it is—not to stuff patients with so many noxious pills and powders as was formerly the practice.

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[1] This statement is not meant too seriously. There are, of course, salvarsan for syphilis, chaulmoogra oil for leprosy, carbon tetrachloride for hookworm, and a few other discoveries.

General sanitation is rated first in order of usefulness because it seems natural to attribute to this cause a considerable proportion of the known rise in healthfulness throughout civilized countries for *a priori* reasons. The spread of education, bringing about as it does better sewage disposal, more attention to the water-supply, purer foods and saner diet, greater consideration of personal hygiene, and better living conditions in general cannot help but result in a lower death-rate. Furthermore, most of the gain in such diseases as tuberculosis of the lungs is to be put under this head. There is indirect evidence that this is the case in a comparative study Pearl has made of the general trend of the death-rates of phthisis, typhoid, diphtheria, and dysentery on the one hand, and of bronchitis, paralysis of unspecified cause, septicæmia, and softening of the brain on the other. The first four affections have been the subject of particularly active health measures in the United States during the period since 1900, yet death-rates attributable to them have decreased no faster than the death-rates of the second four, against which there has been no special campaign. One can hardly account for such results except by assuming that the human race is gradually learning to take care of itself better than it did in the past. There is certainly no evidence of developing inherently sounder constitutions at anything like the rate of change found.

Though it seems probable that in the aggregate more lives are saved to-day by the application of ordinary preventive measures, the great artistic triumph of the medical craftsman is serum treatment. Smallpox, diphtheria, typhoid, tetanus, and yellow fever have been practically abolished, and could be abolished actually if mankind applied the knowledge it possesses intensively and thoroughly. Even if one mentions none of the minor diseases to which serum treatment is applied, this is a veritable triumph.

Smallpox was the scourge of the Middle Ages. It is often said that everybody in Europe had smallpox until

Jenner's vaccine came to save them. They simply died, or lived with scarred faces. To-day the loss is negligible. Until 1895 diphtheria was the dread of every household containing young children. In 1895 the antitoxin against the diphtheria germ was introduced into medical circles, and as its use spread, so dropped the diphtheria death-rate. Where formerly the deaths ranged from 20 to 50 per cent of those affected, to-day treatment on the first day of acute symptoms results in the recovery of almost every case. Tetanus, or lockjaw, a germ harbored in the intestines of the horse and other animals, was rightfully feared as absolutely deadly a generation ago. It killed nine out of every ten men who were attacked during our Civil War. In the World War an occasional case was exhibited to visiting physicians as a curiosity. In the Civil War a little over 10 per cent of all deaths were from typhoid. In the Spanish-American War 20 per cent of all the American soldiers were infected, and 86 per cent of all deaths were attributable to it. In the World War between September, 1917, and January, 1918, a period of about the same length as the war of 1898, there were three-quarters of a million men in American training-camps daily. At the rate prevalent in the earlier war there would have been 150,000 typhoid cases and 15,000 deaths; actually there were but 114 cases. During the whole period of the war, if the conditions of two decades before had prevailed, typhoid would have carried off between 150,000 and 200,000 men. Just think of the difference! The other day a prominent Boston physician told the writer he thought he had a case of typhoid fever, but he would not be certain until he had made further tests, for he had not seen a case for fifteen years. The latest important pestilence to be crushed under the heel of science is yellow fever, the terror of the American tropics. When it was found to be carried by a mosquito, the victory was by way of being won. It was controllable; it was controlled; and the Panama Canal was built. Now reports are coming in that the serum treatment of Noguchi is successful in conferring immunity on inoculated persons. This means unconditional surrender.

Under the third heading, prevention of infection, one might logically list special hospital sanitary measures, isolation of suspects, quarantine, and so on; but the important advance in medical research making this division important is the increased control of parasites living on specific lower animals as secondary hosts. Under this heading come the malarial organism, borne by one of the mosquitoes; typhus fever, the scourge of war-ridden Europe, borne by the louse; and the bubonic plague, the great pestilence of the Middle Ages, borne by the rat-flea. In addition there are the hookworms, the nematode worms causing that awful disease of the tropics known as elephantiasis, and many others of minor importance.

Finally, there is the great operative triumph of modern surgery. There is surgery of the internal organs, liver, appendix, spleen, intestines, bladder, kidneys. There is surgery of the brain. There is surgery of heart, lungs, and large arteries. And all done with a mortality less considerable than once occurred after the slightest of minor operations. With the disappearance of sepsis and gangrene, the destroying agents formerly on hand in every hospital, one might indeed list surgery with the fine arts.

The surgeon's rescue work is pretty well distributed among man's seven ages. He saves many babies—and their mothers—and helps the former to lives of greater usefulness by abolishing the effects of enlarged adenoids and germ-laden tonsils. He is the emergency repair man, removing tumors, curing hernia, restoring broken bones, healing compound fractures, in short, putting again in working order numerous organs that have been put out of commission by accident or disease. Thus he not only prolongs life but increases efficiency during life.

After even this brief survey of what is happening in medical circles, it must be obvious that the fears of neo-darwinian calamity-seekers are largely groundless. There is a certain amount of reversal of natural selection, as has been already noted, but it seems to me that a great deal of it is solely of academic interest. At any rate, it seems probable that the intangible tendency of the art of healing to breed a weaker race can be wholly overcome by sound wide-spread advice against marriages that presumably will result in children with clubfeet, cleft palates, dwarfed limbs, and other skeletal abnormalities, with hæmophilia and similar circulatory aberrations, or with deficient nervous systems advertising themselves by epilepsy, feeble-mindedness, and insanity.

Admittedly the above suggestion is speculative; the following thought is more than a surmise. It is to the effect that perfection of natural specific immunological mechanisms is unnecessary in the case of completely controllable diseases, provided public health work is thorough and people are guarded against sudden outbreaks. For this reason the application of new methods designed to abolish them cannot possibly affect adversely the inherent soundness of the human body.

There are both facts and logic behind this view. The diseases hitherto conquered or on retreat are the contagious and infectious diseases caused by parasitic plants and animals, such as bacteria, protozoa, and worms. Among them are typhoid, cholera, diphtheria, puerperal fever, hydrophobia, smallpox, typhus, yellow fever, plague, and malaria. Numerous others of lesser importance could be mentioned, but these will suffice. Probably the organic causes of no single one of these diseases can live more than a very short time outside of the body of their hosts. The better they are controlled, the rarer they become; and it is not at all fanciful to assume that in time they can be banished forever. They will simply be annihilated, and will disappear from the face of the earth as numerous animals and plants have disappeared before. As they become rarer and rarer, their control becomes easier and easier. Cholera, typhus, bubonic plague, and smallpox still exist, but the death-rate from them in the United States is negligible, merely because chance of infection is so rare.

Now I take it that none of these diseases is prevalent merely because the organ systems they attack are weak. They attack willy-nilly, and are successful if natural immunity evolved through long selective experience is not sufficient to prevent their gaining a foothold, or if artificial preventive measures are not effective. They struggle for survival just as any other organisms, and simply use their hosts as a convenient food-supply. One cannot complain of his motor if he spills emery in the engine, nor of his digestive system if he drinks typhoid bacilli in his milk. Protect the one from dust and dirt and it will run, protect the other from noxious germs and it will do yeoman service.

There seems to be no reason whatever, therefore, for evolutionists to make long faces over the assumption that progressive work of this type is inherently bad for the human race. Mankind needs natural protection from these scourges only when it does not have the protection of science. There may be minute organisms on Mars which could annihilate the whole of the genus Homo with neatness and despatch, but if they remain on Mars they will inspire us with no awe whatsoever. There is a lesson in this regard from the history of smallpox, the first of the controlled diseases. Vaccination caused it to all but disappear from the United States. Since it has become so rare and there is small risk of infection, people no longer fear it and have become slack in their precautions. I venture to say that half the people in the country would come down with smallpox if exposed. Do we worry? Not at all. Fortunately there is no evidence that new bacteria and protozoa are arising for our affliction. There is always a chance that some old and rather rare parasite will give rise to a virulent strain and sweep the world like the catastrophic plagues of mediæval times before an organized effort can be made to stop it; but one should have sufficient faith in medical prevision, knowledge, and ability, to feel that such an eventuality is in about the same category as total destruction of the human race by some erratic body from outside the solar system.

In this chapter I have endeavored to point out that though death is inevitable to all and must come to some sooner than to others because inherent strength of constitution is variable, nevertheless only too often death comes prematurely. Our people are cut down as babies, as children, as young men and women. In the past this bitter potion, which was the lot of so many millions, was nature's method of strengthening the race. Our ancestors were those who conquered in this struggle, for only those who conquered became ancestors. The weak died, the strong lived, and endowed their descendants with their strength. Even today this process of natural selection is going on, hence there is often a racial value in premature death. But man has put his intelligence to the task of restraining the hand of natural selection, of softening her cruelties, and of modifying her careless methods. And he is succeeding. The expectation of life of each new generation is greater than for the generation which went before. Life is being prolonged, not in the sense of increasing the natural term of existence, but in the sense of preventing death from creeping in and clasping his victim before his allotted time. And this success of medical effort is not to be decried as an undermining of the racial stamina. With proper eugenic precautions it may even result in promoting strength instead of weakness; the trend of the race may be upward rather than downward.

But if these are the high lights of the picture, there are also shadows. The law of Malthus is inexorable. If the world gives its attention only to the eradication of disease as a means of prolonging life, it will be disappointed in the result of its exertions. If mankind insists on filling the earth with people beyond the proper limit, then Nature will step in and eliminate the excess in spite of the best-laid plans. In the next chapter I shall show how intimately these questions of the public health are bound up with the population problem. We shall see that birth restriction is an absolute prerequisite to continued medical progress.

CHAPTER VIII

THE RELATION BETWEEN BIRTH RESTRICTION AND THE PUBLIC HEALTH

When germ diseases are exterminated, natural immunity to them is useless; hence the campaign against the animal and vegetable parasites afflicting humanity is biologically sound. When diseases do not yield to the attack—and probably we shall never be able to dodge all of Nature's traps—the results of the lethal selection thus brought about will in the long run be somewhat beneficial to the race because of the survival of individuals with greater natural vigor. The bad feature attending the success of medical effort, therefore, lies neither in the elimination of infectious diseases nor in the failure to control those having a survival value; it lies in the preservation and perpetuation of those functional abnormalities both physical and mental which tend to impair the happiness and efficiency, and thereby the social value, of the individual. We are making stupendous efforts to prevent natural elimination of the anomalies, the lack-wits, and the ne'er-do-wells. The first part of this responsibility, preservation, society ought to accept in the interest of its own ethical development; the second part, perpetuation, is a sad mistake. And if the still small voice of common sense ever makes itself heard, there will be two changes for the better in future procedure. There will be as much recognition of and aid for the efficient as there is now for the inefficient; and there will be some slight police regulation and a great deal of educational restriction of the birth-rate among those who cannot bring healthy capable children into the world. The first change will show intelligence, the second will bespeak wisdom.

The public money is now spent largely on the indolent, the pauper, and the criminal. Institutions are provided for the lame, the halt, and the blind. There are almshouses by the score. There are free hospitals and public clinics. There are schools for feeble-minded and backward children. This type of social sanitation may be wholly proper, though in part the results are of questionable value; but one wonders why a whole-souled benevolence must include the encouragement of the recipients to produce increasing battalions of their own kind to weigh down the burden of the next generation. And one is entitled to ask why this benevolence stops at just the wrong place. Why are there not schools for precocious and brilliant children? Why do the ambitious and industrious have to fight so hard for education and for health? Why are the rotten timbers of society repaired and painted, while the more solid framework is abandoned to wind and weather? Why is the producer repressed and his fertility restrained to make room for the parasite? One of our prominent social workers is quoted as saying that every child is worth $5,000 to society. Stuff and nonsense! Some of them are not worth 5,000 Soviet roubles—they are liabilities, not assets; others are worth golden millions. If prosperity is to be promoted, the assets should be increased and the liabilities reduced.

But, after all, though the programme of social sanitation is not sound in every respect, though it has its limitations and its foibles, it is so generally desirable that it ought not to be allowed to fail. It would be better to keep it going, and to improve it in these weak points. The weak points are the genetical, the eugenic, aspects; and it is a remarkable coincidence which emphasizes the importance of the biological point of view in human affairs, that the question of success or failure depends primarily on whether or not the great genetical problem of population is carried through to a practical solution. A few paragraphs of explanation will make this clear.

In all civilized countries the death-rate at early ages is shifting downward, and if the children thus saved are mentally and physically normal, efficiency thereby rises. There is great economic waste in producing children just to see them die. For from 16 to 20 years children have a minus value. The physical energy and time of the mother is spent in preparation for the newcomer. She is more or less eliminated from other labor from the time of advanced pregnancy to the period of weaning. She must give a part of her time throughout the next decade and a half to proper training and care. The earnings of the father, as well as much nervous energy if he is a proper father, are in part devoted to each of his progeny. There is no question then but that infant and child mortality is a terrible waste. With increased expectation of life, there comes an increased efficiency not only to the mother directly and to the father indirectly, but to society as a whole because of the earning power as adults to which stage the children saved attain.

On the other hand, if there is a decreased mortality without a decreased birth-rate, the subsistence problem becomes more and more intense. A greater natural increase results, the world fills up faster, and economic difficulties become more numerous.

There is also a change in the distribution of the population. This is a feature which is perhaps more important than all others. The plagues which are by way of being eliminated are more prevalent in those families grading lowest in the economic scale. It is just these families that have the highest birth-rate. The effects of a differential birth-rate have been kept down by a differential death-rate. What will happen if the latter is removed? The result depends on whether a decrease in the birth-rate of the near future takes place with greater speed among those who are the poorest national assets. If it does, the nation concerned is on the upward grade; if it does not, deterioration and decay are sure to follow.

From the view-point of the student of population the trend of the death-rate downward is not a particularly hopeful sign, unless conditions of living are such as to make life reasonably happy. A continuous life of disease and poverty is hardly more to be desired than a peaceful death.

To-day distress is rather wide-spread in the world. It arises from a variety of causes, all but one of which are removable. The World War cost can be paid in time—if people work; enhanced production can bring more material comforts—if people stop striking, settle their difficulties sensibly, and work. Inequitable distribution, in so far as this exists, can be changed. The wholesale waste in governments and in business can be eliminated. And even local difficulties arising from overcrowding can be overcome—at least for the white race—because there is still new land in the world. But if every economic reform looking forward to justice for all should be immediately enacted, there would be no such millennium as Marxians continue to teach. There would still be that enormous percentage of congenital incompetents, too nearly normal for institutional care, too subnormal to earn more than a bare subsistence when paid the full production value of their labor. "The poor always ye have with you" is a great truth.

If these be the facts while there is still room for more people on the earth, what is to happen in the near future when world saturation in population comes? *It seems to me there is no escape from the conclusion that after a period of falling death-rates there must be a period of rising death-rates, unless through birth restriction a stationary population is established which is below the limit of saturation by such an amount as will give the normal man a reasonable chance for a life with some degree of comfort.*

Malthus was wholly correct in supposing that the economic battle takes an indirect toll on life which amounts to a large proportion of the whole. The white race is therefore impaled firmly on the horns of a dilemma. No matter what social reforms are adopted, no matter how many wonderful discoveries are made in medicine or how carefully they are applied, if natural fecundity is given rein the effort will be useless. Unless population growth is stopped by general agreement, it will be stopped by nature; and the cynic will laugh at humanitarian efforts for child protection and general welfare. Like old Procrustes with his bed to which all travellers were forcibly adjusted, Nature is going to make us fit in with her deep-laid plans. If we grow too large, we will be cut down forthwith; if we have sense enough after fair warning to keep to the proper standard, we will be let alone.

In these remarks I am speaking of the white race in general, and that portion of it which lives in the United States in particular. The black race will follow the American Indian into a gradual decline, except that part of it which is amalgamated with the white and yellow. The yellow race, controlling no great expanses of underpopulated land, has already practically reached the point the white race is approaching, as has also the brown. Every bit of evidence available shows the Chinese to be nearly stationary in population through the natural pressure of population on subsistence. Her birth-rate and her death-rate both are high, and there is little chance of either being changed materially in the near future. The Rockefeller Foundation has gone naïvely into China bringing her the blessings of Western medical art and sanitation. How they are going to support the people they save remains to be discovered. Presumably their efforts to keep on an efficient working basis those who have passed safely through the hazards of a Chinese childhood will be crowned with some success. But to suppose that infant mortality can be cut down and population increase promoted when there is not enough food to go around as it is, strikes one as merging the sublime and the ridiculous. It would seem more sensible to start in with lessons in business efficiency and transportation, since these might aid in keeping their larders filled.

Having arrived at the above conclusion regarding the prospects of the white race, an important question arises: What death-rate can eventually be maintained in a stationary population kept perpetually below the subsistence limit marking a reasonable degree of comfort?

An examination of the crude death-rates in various countries gives very little information because most countries have a constantly shifting age distribution. Only France among the white countries had approached a stationary population before the war. During the twenty years previous to 1914, France had a crude death-rate averaging slightly under 20 per thousand. Her mortality figures were not relatively high, though they were a little above the average for western Europe. Her infant mortality varied all the way from 78 per thousand living births in 1912 to 169 in 1898. A fair guess would be that France could reduce her general death-rate to 17 per thousand by persistent effort. This would mean an average expectation of life at birth of about 60 years, which is clearly somewhere near the limit of probability.

Few statisticians have investigated thoroughly this problem of the properties of a stationary population. Realizing that crude death-rates cannot be compared, they have adjusted the death-rates to the age distribution of a standard population. But the trouble with their standards is that they are arbitrary samples of an increasing population. The one most generally used is that of Sweden for 1890; but it obviously is not a stationary population, for Sweden in that year had an excess of births of 12.12, and ever since then has been increasing at a rate of about 11 per thousand annually. The second population standard dividing favors with this one is based on the population of England and Wales in 1901 with a manifest deficiency in persons from 15 to 25 years of age. This also was an increasing population with an excess of births over deaths of 11.6 per thousand.

The crude death-rates for several countries and the same death-rates adjusted to the age distribution of England and Wales for 1901—the Standard Million—are as follows:

Country	Crude death-rate	Adjusted death-rate
Russia, 1896–98	32.80	28.61
Austria, 1899–1901	24.83	23.12
Italy, 1900–2	22.72	20.23
Germany, 1901	20.84	19.52
United States Reg., 1900	17.55	18.05
France, 1900–2	20.80	17.50
England and Wales, 1901	17.16	17.16
Belgium, 1899–1901	18.53	16.78
Ireland, 1900–2	18.27	16.59
Holland, 1898–1900	17.32	15.40
Sweden, 1899–1901	16.78	13.88
New South Wales, 1900–2	11.72	13.10
South Australia, 1900–2	11.02	11.73

These figures are interesting in themselves not only because they show the folly of comparing crude death-rates, but because they exhibit on a properly comparative basis in the third column the mortality death-rates of most of the important white countries at the beginning of the twentieth century. The enormous range, from 28.61 per thousand in Russia down to 11.73 per thousand in South Australia, is an extraordinary thing, and brings out strikingly the room for improvement in Europe and the United States. But one obtains no true idea of what is a reasonable prospective mortality rate for a continuously stationary population by this particular adjustment. France, for example, with what comes nearest to a natural stationary population, is adjusted downward 3.2 per thousand; and South Australia is given a figure obviously impossible as a continuous performance, for it sets the average length of life at 85 years.

The preceding table has been presented because the method used is very common in books on vital statistics, and comparable figures are found in many texts. But if one wishes really to compare death-rates on a scientific basis, he must turn to the work of Glover,[1] where "life-tables" are found based on constant populations. These "life-tables" are constructed for various actual populations characterized by certain specific death-rates determined from the census records for each age. On the assumption that the population is continuously subject to these mortality rates, and that there is no emigration or immigration, one may determine the maximum population evolved and the age characteristics of this population when the number of deaths per year is exactly the same as the number of births. Starting with the supposition that there will be 100,000 uniformly distributed births each year, for example, and that the death-rate for each age is a known constant, then eventually a population will arise wherein the 100,000 births will be balanced by 100,000 deaths. A great many interesting facts can be learned by the study of such stationary population

AVERAGE DEATH-RATES CALCULATED TO STATIONARY POPULATIONS

From Glover's data

	Male death-rate	Female death-rate	General death-rate average
Australia, 1901–10	18.12	17.00	17.56
Denmark, 1906–10	18.21	17.27	17.74
England, 1901–10	20.61	19.09	19.85
France, 1898–1903	21.86	20.35	21.10
Germany, 1901–10	22.31	20.69	21.50
Holland, 1900–9	19.61	18.71	19.16
India, 1901–10	44.27	42.90	43.58
Italy, 1901–10	22.60	22.31	22.46
Japan, 1898–1903	22.74	22.30	22.52
Norway, 1901–10	18.24	17.32	17.78
Sweden, 1901–10	18.34	17.55	17.95
Switzerland, 1901–10	20.30	19.18	19.74
United States Reg., 1901–10	20.28	19.03	19.66

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[1] Glover, J. W., "United States Life Tables." Bur. of Census, 1921.

tables, but the particular point useful to us here is the average annual death-rate. I have calculated it from Glover's data for the several countries concerned. It is shown separately for males and for females, and there is no great error involved in assuming that the rates for the general population are the averages between the two, although the sex ratio is not exactly one to one.

Though the same countries are not considered here that were examined in the other table, and though the years covered are not identical, it is clear that death-rates adjusted to the Standard Million (England and Wales, 1901) are not good death-rates for the student of Malthusianism to use when he wishes to estimate the probable minimum death-rate of the future in order to determine the maximum birth-rate allowable if overpopulation is to be prevented. Here one finds that Australia, whose crude death-rate of 10 or 11 per thousand seems somewhat miraculous, actually has a stationary population death-rate of approximately 17.56. Australia does indeed lead the countries cited in healthfulness and longevity, but she is only slightly ahead of the Scandinavian countries. The most remarkable fact is the uniformity of the standardized death-rate of the countries of Europe and of the United States, rather than the variability. When one compares their low death-rates with the terrible mortality in India, the comparative progress of the white race is noteworthy.

Now if one takes this table as a basis of computation and assumes a possible reduction of infant mortality to 50 per thousand living births, a reduction of 50 per cent in maternal mortality, and an elimination of easily controllable germ diseases partially balanced by an increased mortality in late ages, he arrives at a figure of approximately 15.5 per thousand as the probable minimum death-rate for a population constant in numbers. We thus obtain a possible mortality figure for the white race by a more exact method, which is not far from the guess made by simply observing the crude facts in the case of France (17.0 per thousand). The lower figure is possible, but one may doubt whether an average length of life of over 64 years for every child born alive is probable; it is just as well, therefore, in order to be on the safe side, to take a figure between the two, say, 16 per thousand. The goal toward which medical research turns, and which it may attain if the proper precautions are taken, is a death-rate of 16 per thousand of the population annually. It is a figure which ought to be invested with more interest for us than all the magic sevens of antiquity. It is the basic figure, to be kept in mind during the discussion of birth-rates in the next chapter, for if the white race succeeds in reducing its generalized death-rate to 16 per thousand on the basis of a stationary population, it will take just 16 births per thousand to keep the population stationary. Moreover, the final point to be made in the present discussion involves it as well, since it is now proposed to show why this low death-rate can only be reached and retained in countries whose populations are kept below the limit at which subsistence presses heavily.

If one stops to consider the question fairly, it becomes unnecessary to give a direct demonstration of the effect of the economic struggle on the death-rate. It being obvious that a given territory is limited in the number of people it can support, it should also be apparent that when that limit is reached, all surplus will be eliminated by a high death-rate. One usually grants this conclusion without argument, but one dislikes to admit the rising of the death-rate from causes connected with the ordinary business of life before the subsistence limit is reached. It is more comforting to imagine the vessel holding the contents neatly and safely until it runs over at the top. Nevertheless, the matter does not work out this way. During a considerable portion of the active life of man, his death-rate is so much higher than the death-rate of woman for diseases of the respiratory system, of the skeletal and muscular systems, of the alimentary tract, of the skin, of the nervous system, and of a host of minor causes of death, one cannot avoid the conclusion that he is actually handicapped severely by his commonplace activities in making a living. In addition, both maternal mortality and infant mortality show a marked rise under adverse economic conditions.

The broad generalization is thus unimpeachable, but it is more than difficult to weigh the various causes accurately and to estimate the proportionate mortality to be attributed to each. For example, if one compares the infant mortality in families having large incomes with that in families having small incomes, a significant correlation between death-rate and poverty is nearly always found. But does poverty in itself cause a high infant death-rate, or is poverty merely a symptom of deeper-lying causes? Is not poverty often bound up with inherent incapacity, with vicious or unhealthy customs, with hereditary predisposition to certain diseases, or perhaps only with ignorance? It seems to me that such connections must exist; for this reason I would not come to any dogmatic conclusions as to the exact meaning of the relationships shown in the data presented in the next few pages; rather would I say that they point severally to the fact that external conditions do have a marked effect on the death-rate.

Perhaps the easiest way to make progress in public hygiene is by cutting down maternal mortality. The mother has passed the hazards of infancy and childhood, and has reached the height of her value as a national asset. In the provisional birth-registration area of the United States for 1910 there was a maternal mortality of 6.5 per thousand live births. Thus from 14,000 to 17,000 women in the country are struck down annually at the peak of their industrial activity. In Sweden, Italy, and Norway the maternal deaths for each thousand children born alive are a trifle less than three; in Prussia and Hungary somewhat less than four; in England and Japan just over four; in France, Scotland, and Australia slightly over five; and in Switzerland, Spain, and Belgium a little less than six. These calculations are made on averages for not less than three years each during the period between 1901 and 1910, and are reported as a proportion of live births because this is one of the most accurate of the methods used. If the data for the registration area of the United States are representative, therefore, the country has the unenviable distinction of leading the civilized world in maternal mortality.

As a matter of fact these death-rates have shown little tendency to fall in the majority of countries during the last few years. In England and Wales, Ireland, Japan, and possibly New Zealand and Switzerland, the rate diminished somewhat in that part of the twentieth century before the war; but in the remaining countries it is either stationary or rising. Since from 30 to 60 per cent of the total deaths are due to a single controllable disease, puerperal fever, and since about half of the remainder are controllable, one can only ascribe the present state of affairs to neglect. In up-to-date hospitals the maternal death-rate is not over 15 per cent of what one finds in the general population. For this reason it seems very conservative to predict that the deaths from pregnancy and confinement may be cut down to half of the present rate.

But the difficulties in the way are chiefly economic, and if the competition for place gradually becomes more keen because of a greater and greater population, these difficulties will undoubtedly increase. To-day the general public is not aroused to the dangers of childbirth, because they believe it to be a normal process which does not call for any particular attention. There is no question that it is a natural physiological function, but this does not prevent it from being more or less of a crisis, and six mothers dying for every thousand new arrivals is sufficient proof. Beyond this condition of ignorance and of lethargy in face of the facts, however, is the plain truth that women cannot get proper care at this time without a considerable outlay of money—money which can more easily be found to-day than when diminishing returns in agriculture have become increasingly in evidence.

The requisites are rather large. There ought to be a network of establishments furnishing information as to the proper hygiene during pregnancy, and a travelling nursing service. Hospital treatment for difficult cases is essential, and for every case advisable. If hospital treatment is impossible, the least one can ask is skilled medical attention at the home. And besides all this, a certain amount of rest is required by the mother. It ought to be three months, and must be six weeks.

Clearly these requirements present some difficulty in the city, and almost insuperable obstacles in the rural districts. If each mother is allowed two months complete rest from gainful employment and from arduous household duties, just previous to and just after the arrival of the newcomer, if she has proper advice, careful nursing, and skilled medical attention, there must be a margin of productive efficiency above the needs of mere existence, for this attention costs money.

It is distasteful to put such a matter on a monetary basis, but its absolute dependence on economic considerations must be faced. The physician to-day finds obstetrics the most poorly paid and the most taxing branch of medicine. The most efficient and best-trained doctors are thus turned into a more lucrative practice. The most efficient nurses, with the greatest demand for their services, often refuse to attend confinement cases. The result is that a few of the well to do have proper service because they can afford to pay well, a few of the very poor have proper service because they can pay nothing, and the host of women of moderate means on whom the country depends are neglected because they can pay only a little. Thus, no matter whether it is proposed to better these conditions through direct state care, by insurance, or by pensions, the cost is a concrete thing and can be met only by enhanced production.

The same sort of Malthusian dilemma is faced in the problem of reducing the infant mortality, although there lies the chance of saving the greatest number of individuals.

"Infant mortality, the deaths of children under one year of age, is the most sensitive index of social welfare and of sanitary improvement which we possess," says Newsholme. In a sense, it is a less accurate health thermometer than one in which prenatal deaths are taken into account. And even as a mortality index it is not without its errors, since the usual method of computation—dividing the deaths of a calendar year by the births of that year—permits inaccuracy not only when there is greater relative registration of either births or deaths, but also when there is a rapid change in the birth-rate, since the infants in the numerator are not necessarily those in the denominator. Nevertheless, it is a vital index well worth while.

Deaths of infants constitute a very considerable proportion of the deaths at all ages. In the United States registration area the proportion is usually between 15 and 20 per cent; but in other countries it is often considerably higher, reaching in India and China 50 to 60 per cent.

If one examines the statistics for the five-year period between 1906 and 1910, when the world was relatively undisturbed by war, and realizes that the figures presumably have diminished during the past century, he is driven to the conclusion that the human race knows very little about taking care of its young. Roughly speaking, the yellow race has an average infant mortality of about 450, if one can place any reliance on the estimates of travellers and of Chinese students who are in attendance at the universities of this country. It is lowered by Japan's relatively fine showing, 157; but is raised by China, where over one-half of all infants die before they reach one year of age. If the brown race as a whole has about the same stamina and lives under conditions similar to those in India, its rate is slightly under 300; since recently published life-tables give India a rate of 290 for males and 285 for females during the period between 1901 and 1910. The infant mortality of the black race is difficult to estimate. In Jamaica, 1906 to 1910, it was 191; in the United States original registration States, 1901 to 1910, it was 241 for males and 206 for females; in Africa, Herbert Lang, the distinguished traveller and naturalist, informs me that it is much higher, possibly even reaching a proportion similar to that of China. The average rate for negroes, therefore, cannot be under 300, and probably is around 350. The weighted average for the white race is close to 150.

For the period 1906 to 1910 Chile had the unenviable distinction of leading the white race in infant mortality with 315 deaths per thousand births. Next in order comes European Russia, excluding Finland and the provinces of the Vistula and Caucasus, with 243, Hungary with 204, Austria with 202, and Rumania with about the same number. Countries with rates between 160 and 180 were the German Empire and Spain. With rates between 140 and 160 there were Italy, Belgium, Bulgaria, and Serbia. Next below, with rates between 120 and 140, stand the United States and France. In England, Scotland, Switzerland, Holland, and Denmark between 100 and 120 die; while in Australia, Norway, and New Zealand the proportion sinks to less than 80.

Pearl's[1] study of the distribution of infant mortality in cities, towns, and rural countries of the United States shows a variation just as great as is shown by these figures for different countries. In several towns the rate for the white population in 1910 reached the extraordinary figure of 18 per thousand, while in a town at the other extreme the rate was over 300; and among the colored population the rate for one county in 1917 mounted to the tremendous figure of 600.

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[1] Pearl, R., "The Vitality of the Peoples of America," *Amer. Journ. Hygiene*, 1: 592–674, 1921.

Since New Zealand in recent years has had an infant mortality rate of about 50, and since numerous towns and cities in both Europe and the United States have been able to reduce the proportion to 60 or less, it seems as if a rate of 50 is not too low a possibility for any country to reach if sanitary measures are good and economic conditions are sound.

The following table shows the trend in various countries during the time that relatively accurate records have been taken. They are not strictly comparable, even in the same countries, because later returns are usually better than those of earlier date; but the general broad conclusion is that the rates are going down.

THE TREND IN INFANT MORTALITY IN VARIOUS COUNTRIES

Country	1881–85	1906–10	Per cent decrease
Hungary (91–95)	250	204	18.4
Austria (66–83)	255	202	20.4
Italy (91–95)	185	153	17.3
Belgium	156	141	9.6
France	167	126	24.6
England and Wales	139	117	15.8
Holland	181	114	31.5
Sweden	116	78	32.8
Norway	99	70	29.3
Australia	125	78	37.6
New Zealand	90	70	22.2

The most remarkable thing about this table is the fact that the countries having generally lower infant mortality rates during the first period were able to make the greatest percentage reduction. And more astonishing still, the reduction in Australia and New Zealand has continued to be great during the years since 1910.

The World War[1] made little difference in infant mortality in Great Britain. In England, Scotland, and Ireland the rates of 91, 97, and 83 respectively for 1916 were the lowest ever recorded; and though they rose slightly in 1917 and 1918, no one looking at the returns would have supposed that the countries were in the midst of a death-struggle.

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[1] Pearl, R., "The Effect of War on the Chief Factors of Population Change," *Science*, *N. S.*, 51 : 553–556, 1920. Also, "A Further Note on War and Population," *ibid.*, 53 : 120–121, 1921.

The same statement cannot be made for all the other European nations engaged. The death-rate for infants rose in both Belgium and France, though not to high figures. Complete returns are not available for either country, but for 77 departments of France the official returns for the five war years were 109, 142, 122, 123, and 138. In Germany unofficial figures showed no more disturbance than in England, 164, 154, 136, and 155 being recorded for the first four years. In Austria, however, there was a slight but not very significant rise.

In the United States we do not know as much about infant mortality as we should. Massachusetts is the only State where records have been kept for any length of time, and there only since 1881. The figures for ten-year periods from 1881 are 160, 157, 136, and 122. A number of studies made from fragmentary statistics, however, lead one to believe that there has been a slow and constant decrease over the whole country. Pearl concludes that there was no significant decline between 1915 and 1918, but presumably the influenza epidemic in 1918 influences this conclusion.

Efficient work aimed at improving both prenatal and postnatal conditions can lead to an infant mortality rate among white peoples of between 50 and 70 per thousand births. But it is only possible to do efficient work where the population is below the saturation point, because only then can the conditions tending to make the death-rate high be controlled. Thus it follows that in China and India, and among the negroes not living in white countries, the hope of a greatly reduced infant mortality is without a secure foundation. It will be reduced in some degree even among these peoples, no doubt, due to a gradual infiltration of knowledge;

but for many years it will remain so high that the white birth-rate may drop much further than is now in prospect before the natural increase will fall below that of the darker races. Still, this is not building for the future. Let us suppose that Europe and America continue to show declining death-rates and birth-rates in such ratios that the natural increase does not change materially for the next fifty years; this gives no one a reason to assume that the death-rate can continue to drop or even to remain stationary at a low rate. Within fifty years the countries in the zones of high initiative will be pretty well filled with people; then infant mortality and general death-rates must rise. Let us see why such a result must inevitably follow.

A most instructive study on this score was made by Miss Emma Duke at Johnstown, Pennsylvania, for the Children's Bureau of the United States Department of Labor. It is typical of several studies[1] made in this bureau under the direction of Miss Julia Lathrop.

Where housing conditions were good and the home was clean and dry, the infant mortality was 105; where similar clean houses were damp, it rose to 127. In moderately clean and dry houses, it was 158; in moderately clean and damp houses, it was 171. Where the houses were dirty but dry, it was 162; where they were dirty and damp, it was 204. Similarly, when the houses were classified on the basis of the water-supply being inside or outside, the rates were 118 and 198 respectively.

Not a great deal of difference was found between the mortality rates in homes where two others slept in the same room with the baby and in homes where the baby slept in a separate room; yet they went up markedly in company with real crowding. And when the baby slept in the same bed as the mother it was nearly twice as likely to die as when it had a separate crib, although even the former rate was low.

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[1] See also Hibbs, H. H., *Infant Mortality: Its Relation to Social and Industrial Conditions.* N. Y.: Russell Sage Foundation, 1916.

In England, several comparative studies have shown an extraordinary risk of smothering where infants shared the mother's bed; but there a great part of the risk was presumably a direct consequence of drunkenness.

Ventilation played a star rôle in the Johnstown studies. Where it was good, the rate was 28; where it was fair, 92; and where it was poor, 169. Where physicians attended, the rate was a great deal less than where there was a midwife. With literate foreigners, it was 148, with illiterate foreigners, it was 214. Breast-feeding and rest before and after confinement also had marked effects for the better.

Now, such studies confessedly have their errors and fallacies. From them one cannot make any hair-line decisions as to the particular effect of individual causes. It is better to admit this at once, rather than to make the specious arguments so often made by social workers from similar data. An illiterate worker is likely to be stupid and incapable. He will be poorly paid and will live in slovenly quarters. He will often hate fresh air because he thinks it poison, and he will probably feed his six-months-old progeny dill pickles because he believes them to be delicacies. Yet, even so, all of these things are not invariably concomitant, and the differences exhibited by the infant mortality rate whenever one of the environmental factors is changed for the better, show which way the wind blows.

One finds the same thing over and over again in the sociological investigations of England, France, Germany, and Belgium. Bad food, slovenly habits, dirty houses, crowded conditions, each and all exert a baneful influence on infant life, but when one tries to study matters accurately he finds it very difficult to measure the specific effect of the factors bringing about the result. All he can say is that it is the effect of bad environment. For example, there are some scores of European investigations each showing the superiority of rural over urban conditions; and in Europe there is not the great racial difference between the country and the city populations that exists in the United States. What then is the cause? Since medical attention and other artificial means of prolonging the life term are better in the cities, it seems as if country superiority must be due largely to a better and more ample food-supply of mother and of infant, and to more fresh air and less crowded conditions of living. But which factor bulks the largest in the total it is impossible to decide to-day.

The point I wish to emphasize, therefore, is this: infant mortality cannot be cut down and kept down unless conditions of living are good; and conditions of living cannot be good unless a given population is much below the saturation point. And in this connection it must be said that there seems to be no escape from the association between the birth-rate and the death-rate, so often observed by statisticians the world around. In general, a high birth-rate means a high death-rate because of inhospitable local conditions at any and all times, but when the limits of the world's sustaining power are approached the association becomes general and unavoidable.

A great deal of ink has been spilled over how to alleviate these conditions which bring about high infant mortality. The Children's Bureau ends its most popular bulletin with the slogan "Poverty is the Baby's Greatest Enemy." The social workers of England and Germany come to the same conclusion. In a sense this is true, but let us not follow those who make the naïve suggestion that raising wages is the simple and easy way out of all the difficulties. The opinion of Newsholme that maternal ignorance is only a comfortable fiction of the well to do by which to account for infant mortality is only partly right. Probably if other things were equal, the mentally normal mother without schooling is nearer to the college graduate in knowing how to treat an infant than the college graduates are wont to believe. But the phrase "other things being equal" covers various and sundry matters of importance. The college graduate who cannot or will not nurse her baby gives a great handicap to the illiterate mother who can and will, but she regains a lot of lost ground in other ways. It is only too true that in general real poverty is the result of inherent incapacity, and it is made more distressing by child after child arriving with no opportunity for a mother's proper care.

It is this feature of the situation that makes the blandly childlike suggestion to raise wages rather absurd. We have just had an extended inquiry into the national income made by the National Bureau of Economic Research, consisting of distinguished economists and statisticians. It turns out to be about 60 billion dollars, or close to 600 dollars per capita. This means that if all the incomes in the United States were levelled, each family could *not* have the income that Mr. Lauck assumes is necessary to keep up that mysterious phantom, the American Standard of Living. Now, very few people believe that every man's value is the same. They merely want their own income levelled up to a higher scale. Thus it follows that millions of people in this the richest country of the globe are not producing enough and cannot produce enough to bring up several children properly or even to give several children a fair chance for life. By cutting down governmental extravagance and by making a more equitable distribution of wealth, Opportunity can be brought to many a door where now she never knocks; but to suppose that any such change in wealth distribution can solve the population problem is sheerest nonsense. One simply must face the fact that the productive capacity of a goodly proportion of all people is too low to keep every one away from Malthusian pressure, and that this proportion *must* rise in the future unless the population remains far below the economic limit. If it does so remain, the more fortunate can then help the less fortunate, and medical success in reducing the death-rate is assured.

CHAPTER IX

THE SIGNIFICANCE OF THE DECLINING BIRTH-RATE

ONE of the most extraordinary social phenomena of modern times is the decline in the birth-rate, which began in France before the Revolution, and has spread during the last half of the nineteenth century to a large proportion of the countries of the white world. The causes and the effects of this trend merit serious investigation. Instead, they have come to form merely a subject upon which our numerous varieties of publicist exhibit an intense emotionalism which is sometimes wholly devoid of reason. A veritable torrent of sound and fury on the matter has streamed from both platform and press; but in it all one rarely finds an attitude of earnest inquiry; there is either trepidation and alarm or impulsive optimism.

The political imperialist of the Napoleonic school has viewed the diminishing birth-rate as a fearsome thing for the particular country of his citizenship, though quite proper for any other country. To him national prestige and power are above all other considerations, and these he has assumed to be obtainable only through an expanding population.

Thoroughly organized propaganda has been carried on by this school only in France, Germany, and Japan during the past generation. The spokesmen of imperial Germany made no attempt to disguise their philosophy except as it touched their desire for personal power. They taught freely that there should be more Germans because the uniquely superior heredity of Germans made them the sole instruments capable of bringing a higher civilization to the world. If in following this teaching they found the boundaries of Germany too narrow, there was other land to be gained by a just and holy war. The sincerity with which the German people accepted this doctrine, which bore its fruit in 1914, has been the psychological wonder of the world. And it is very much to be doubted whether it has been abandoned in the republican Germany of to-day. In Japan, also, the teaching is having its effect. Japan has developed a race-pride insistent to insolence, which keeps her in continual diplomatic arguments. And in the representations of her foreign office one may read as clearly as in her chauvinistic journals an inordinate desire for power, though her ambitions are cleverly masked by the claim that she wishes only to satisfy the necessities of a rapidly growing population. In France, the indoctrination of expansionism has been barren of results, in spite of the persistent efforts of politicians who must know that the country cannot produce enough food to support the numbers it holds to-day. The French National Alliance for the Increase of Population has recently offered a grand prize of 50,000 francs and several smaller prizes for books which expose properly the perils of a falling population and which make practical suggestions for remedying the situation. But, as *L'Œuvre* says, printing pamphlets cannot be expected to increase the population of France. An increased birth-rate in a nation of individualists is not likely to be brought about even by fear of consequences. Only a militaristic zeal disguised in the form of a race-religion, as in the case of Germany, would induce a change; and French experience with this infection at the beginning of the last century has conferred a high degree of immunity on the people.

A low birth-rate is viewed with repugnance by certain individual leaders of most Christian sects, and with complacency or approval by others. In only the Catholic Church, among churches having a large membership, is there a united expansionistic stand; and this is not strange, considering its mode of government and its traditional conservative attitude toward new points of view. Furthermore, the whole history of the Catholic Church as a seeker of power is such as to lead to this position. Church leaders have usually had recourse to the Scriptural injunction "be fruitful and multiply" as authority for their teaching, though the Book of Ecclesiasticus, which many persons accept as orthodox, bids us "desire not a multitude of unprofitable children." When such teaching is sincere, few will have the temerity to criticise it, even if such faith in the written Word appears to throw a burden of responsibility on God which religious advisers do not adhere to in medical and economic counsel. But not all religious leaders support their ideas on birth decline by quotations from the Bible. More than one are frank to say that it is the manifest duty of communicants to build up the Church in point of numbers.

It is an odd fact, illustrative of the vagaries of the human mind, that Karl Marx and his orthodox followers have also denounced and ridiculed birth restriction as violently as the most extreme imperialist or cleric. They have been unable to realize the capitalistic advantage in the continued prolificacy of the working classes. Intent on building up a melodrama of class-conflict, Marx derided any one who placed the responsibility for human misery in other hands than those of capital. One wonders what the next century will think of a man who proposed to remedy all social ills by regulating and sublimating the Hunger instinct in a peculiarly impractical manner, oblivious the while to the bearings of the Love instinct on the matter.

Others who have shown considerable alarm at the receding birth-rate would not carry their policies quite so far as either the militarists or the ecclesiastics. With Marchant, the secretary of the English Birth-rate Commission and author of *Birth-Rate and Empire*, it is race-pride placed on a basis assumed to be ethical. He feels that the English are in duty bound to populate their colonies to the utmost, or to abandon them to peoples living in countries already filled to overflowing. No doubt he would deny any idea of further conquest, or even of filling the English colonies so full as to cause extreme economic pressure. Roosevelt, also, who was accused of imperialistic tendencies by the socialists, probably meant no more by his plea against race-suicide than to advise his countrymen to build up a strong progressive nation. Roosevelt was impulsive, but he was preeminently fair, and his last few articles on the subject, after he had had time to give it sufficient study, were hardly more than sermons against a shirking of responsibility by those whose innate endowments made it in a sense a duty for them to fill their places in the state. From the mature conclusions of Roosevelt, one should class him with those who fear the differential birth-rate in favor of the incompetent and the worthless, rather than with those who preach overpopulation in order to build up an aggressor's excuse.

To the extreme socialist of some of the brands other than Marxian, on the other hand, the reduction in the birth-rate has been a revolt against capitalism by the proletariat, a birth-strike. Quessel[1] quotes Ehinger as giving the best sociological theory of birth decline in the following words:

> Under pressure of necessity the member of the non-possessing classes sells his life piece-wise, by the week and month. His wages depend, not on the real value of his work, but on the difficulty the employer experiences in finding hands. The greater the number of applicants and the more they underbid one another, the more wretched is their lot. A restriction of births would inevitably lead to the supply of workers falling below the demand. Owing to a proletarian refusal to bear children, the labor markets of the Old World, now suffering from a glut of workers, would come to resemble the labor market of young colonies, where a dearth of proletarians is characteristic. Unemployment would disappear through inadequacy in the supply of labor; wages would rise until they came to represent the real value of the work done; there would be a progressive decline in rent and profit. Thus the scarcity of proletarians would solve the social problem, and would solve it once for all.

The fundamental errors in this naïve economic philosophy are so apparent, one is astonished to find it so widely held.

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[1] Quessel, Ludwig, "In Population and Birth-Control." A symposium. Edited by E. and C. Paul. N. Y.: *Critic and Guide*, 1917.

Such conclusions fail to take into consideration the difference in opportunity in a new country where natural wealth is high and individual competition is at a minimum, and in an old country where the natural resources are small and the competition keen. In the first situation an incompetent may become economically independent from force of circumstances outside of his control, in the second he must possess more or less initiative and ability to rise above the common level. Thus back of this twisted logic, as in many other social proposals that are born of yearning or of envy rather than of wisdom, is an incomprehensible blindness to the differences between individuals in inherent capacity; though in saying this it is not meant to deny the real need of reform in the relations between capital and labor. But aside from all this, the truth is that the decline in the birth-rate is not a birth-strike of the proletariat; it is something originating among those comparatively well situated economically, and which, though gradually seeping downward, has not yet affected the lowermost stratum.

To the moderate socialist and to many temperate conservatives who are not convinced of the practicability of socialism as a mode of government, the waning birth-rate in and of itself appears neither as a goblin nor as a fairy godmother. Serious sociological students, like Havelock Ellis, H. G. Wells, and Dean Inge, view it rather as the sign of an opportunity from which may come either good or evil. They believe that the proper control of human reproduction can mitigate many of the ills to which the human race is heir, and that because of this it is a harbinger of social progress.

The extremists of both types, those who would promote an increased birth-rate to further ulterior motives and those who would restrict the birth-rate as part of the tactics of class war, probably form a small minority among all the people; but they make by far the greater amount of noise. In itself this is no particular misfortune, but just so long as the subject is advertised by emotional outcries from either camp, that long will objective inquiries into its numerous phases be wanting. Nevertheless, there are data from which one may at least get a fair idea of whether the declining birth-rate is a physiological or a sociological phenomenon, and of the immediate effects to which it leads.

Sound statistical analysis of data on human fertility is of very recent date, but a book on the subject really worth while was written by J. M. Duncan as long ago as 1866 entitled *Fecundity, Fertility, Sterility and Allied Topics*, based on English data. One of the numerous questions propounded by Duncan was: How many children does a persistently fertile woman produce, living in wedlock from 15 to 45 years of age, and bearing children periodically up to the end of that time? His conclusion is that the average number is 15. Several other investigators, utilizing data from women of other nations, have reached practically the same conclusions. The fecundity, or capacity of women to bear children, is very large, therefore, unless reduced by some of the various causes either within or without human control. It is so great that if every human pair were persistently fertile, even at the average marriage rate and age of marriage now current in the white race, the annual birth-rate per thousand of the population would be somewhat over 100. Since this rate is more than twice that of the highest recorded birth-rate continued over considerable periods by large populations, it follows that many extraneous factors are at work cutting down fertility.

Undoubtedly, in groups where fertility is not consciously controlled, families are often diminished from what they would be otherwise by heredity and by the effects of previous births. In other words, some women are not inherently strong enough to exhibit continuous fertility, and some are prevented from exhibiting it by controllable adverse dispensations of fortune connected with childbirth. Nevertheless, Doctor Duncan is of the opinion that these depressing effects on fertility are not so great but that married life throughout the reproductive period without voluntary birth restriction will, on the average, bring about a relatively large family. "When a girl of 17 is married," he says, "she may expect 9 or 10 children. If she and her husband hope to escape with less, they are hoping for sterility or death."

The *effective* fecundity, or fertility, of Englishwomen during the period with which Doctor Duncan was concerned was not much over half of this figure. There were at that time many reasons why fertility was not a measure of fecundity. To-day there are additional reasons. But the point of present interest is whether a measurable decrease in fecundity, that is to say, in potential fertility, is taking place among the women of the civilized white world. We are asked by various writers, to whom the wish is evidently the father of the thought, to believe that in a single half-century the natural fecundity of women has decreased to an extent which accounts in large measure for the decreased birth-rate in evidence in western Europe and the United States. We are told that this decrease in fecundity, now going on, will continue at such a rate that it will solve the population problem long before the world becomes saturated with people. Unfortunately for this solution the premises are false. The English Birth-Rate Commission, after hearing all the evidence available, was forced to admit that there was no basis whatever for believing that natural fecundity is undergoing reduction.

The conclusion[1] of the commission came in part as a general biological deduction. It is a strain on the credulity of a biologist to believe that such a firmly established evolutionary function is undergoing a speedy change, when no such change can be demonstrated for characters which are newer and presumably more variable. But beyond this, there are quantitative data from the experience of New South Wales between 1893 and 1898, tabulated by Powys,[1] which furnish critical evidence that the fecundity of Anglo-Saxon women is still high enough to produce a birth-rate of at least 60 per thousand of the population without raising the proportion of married women, provided those who marry do so before the age of 26 years. Powys studied the mean annual number of births from nine to twelve months after marriage after correcting for marriages induced by prenuptial conceptions. He found that the births, stated as per cents of the unprejudiced marriages during the period, were 38.7 for women between 20 and 25 years of age, 39.6 for women between 25 and 30 years of age, and 30.5 for women between 30 and 35 years of age.

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[1] Darwin brought forward the idea that human fecundity had increased parallel with the development of civilization, in the *Descent of Man*. Recent evidence bears out his contention, as students of reproductive physiology like Ellis, Heape, and Marshall agree. Whether this fecundity is fully manifested or not is a separate question.

In New South Wales, therefore, about one-third of the women who marry between 20 and 35 years of age bear a child within the first year of wedded life, and it is altogether likely that even this percentage is reduced by prudential restrictions. When it is realized that the potential fecundity thus shown by the birth of a living first child (which usually presents more difficulties than the birth of a second child) exhibits but a slight decrease to age 35, and that this potential fecundity is somewhere around three times that which is exhibited as continuous fertility during the reproductive period of married life, there is little reason for attributing the decreased birth-rate to a diminished natural capacity for child-bearing. Furthermore, since a natural solution of the population problem by this means must appear by the end of the present century due to the rapidity with which world saturation is approaching, one may dismiss it as a possibility.

The controllable circumstances materially affecting the birth-rate which presumably might have changed during the last two generations are age at marriage, frequency of marriage, causes of sterility, fœticide, and control of conception.

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[1] Powys, A. O., "Data for the Problem of Evolution in Man," "Anthropometric Data from Australia," *Biometrika*, 1: 30–49, 1901; "On Fertility, Duration of Life, and Reproductive Selection," *Biometrika*, 4: 233–285, 1906.

Estimates of the marriage rate are subject to numerous errors which it seems unnecessary to consider here. The main point is that during the past century it shows as practically constant in the countries of Europe presenting the most reliable statistics, no matter what method of calculation is used. There are fluctuations, and these fluctuations follow rather closely the changes in economic conditions; but in England, Scotland, France, and Germany at least the average annual marriage rate per ten thousand of the population, based on ten-year periods, has remained so close to the figure 80 for over half a century that the fact is most remarkable. In the United States little is known as to possible changes; but the rate, as nearly as one may estimate it from fragmentary data, is probably higher than that of western Europe by an insignificant fraction.

The marriage rate of some of the more important countries of northern and western Europe, when expressed as the rate per thousand women of reproductive age—perhaps the most accurate mode of presentation—is shown in the following table. It has declined slightly in England, Wales, and Ireland, and has risen slightly in France and Italy; but the striking thing is its constancy.

PROPORTION OF MARRIED WOMEN TO ALL WOMEN AGED 15 TO 45 YEARS

After Holmes[1]

Country	1880–81	1890–91	1900–01
England and Wales....	514	494	492
Ireland................	395	364	330
Sweden...............	444	454	444
Germany..............	519	515	528
Austria...............	520	504	518
France................	549	545	577
Italy..................	552	...	561

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[1] Holmes, S. J., *The Trend of the Race.* N. Y.: Harcourt, Brace, 1921.

The age at marriage has also remained remarkably constant, despite the common belief that it has increased. In nearly all the countries making up the former German Empire, in France, and in the Scandinavian countries the average age has actually decreased from a fraction of a year to nearly two years in both sexes during the passage of the last half-century. A rough weighted average of the decrease for these nations is .9 of a year for males and 1.3 years for females between the years 1870 and 1910. In England, in Australia and New Zealand, and in the United States, on the contrary, there has been a slight advance in age in both sexes, although on the average it appears to be less than a year.

The prevalency of divorce affects the age at marriage as usually registered, because of the large number of remarriages of elderly divorced persons. And there has been such a great increase in the number of divorces during the past generation among the peoples of western Europe and among their descendants in the recently colonized territories, it seems fair to conclude that if there has been any change whatever in the average age of bachelors and spinsters at marriage it has been a small decline. At any rate, there has been no increase in the age at marriage which would affect the birth-rate significantly.

Nor is it probable that there has been much change in the proportion of sterile women or sterile men. Rubin and Westergaard[1] found that 15.9 per cent of the women of the professional and middle classes of Copenhagen were barren after marriages enduring 15 years or more, but there are many reasons for believing this ratio to be extraordinarily high. Pearson found a ratio of 5.7 per cent in more representative Danish statistics; and Powys determined the proportion among women of New South Wales as 5.6 per cent. Powys believes that 2.5 per cent probably represents a fair average rate for Anglo-Saxon women who are married between the ages of 20 and 30. Of course no one can say whether the rate is going up or going down on the basis of such studies; but it would take a very rapid change in such a low rate as this to produce a marked difference in the birth-rate. Various physicians attribute from one-third to two-thirds of the childless marriages to functional sterility of the wife. The remainder is charged to sterility of the male, which in over 50 per cent of the cases is due to gonorrhœa. It has been much the fashion to say that venereal diseases are on the increase, but I have been unable to find that the story has any basis of fact whatever. The statement would seem to be part of the fairy-tale spread by certain vice-crusaders which attributes venereal infection to every fourth man—a particularly mean and detestable kind of neurotic cynicism. The first real data for the United States on the subject, the army medical examinations, showed the true figure to be about 5 per cent instead of 25 per cent for the general male population. Since many of the causes of functional sterility in women are controllable, and since gonorrhœa is not only controllable but is being controlled more and more because of a wider knowledge of its serious consequences, it is fairly safe to say that any future change in the proportion of childless marriages will be for the better.

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[1] Holmes, S. J., *op. cit.*

The fact that there are no statistics on the subject paves the way for the same sort of harrowing exaggerations in regard to the number of fœticides, or artificial abortions. Max Hirsch places the number at 2 million annually in the United States. The estimate of W. J. Robinson is 1 million, and the estimate of J. W. Williams of Johns Hopkins is half a million. The last guess is undoubtedly the most reasonable; but it is still a guess, and probably too high a guess. I make this statement because the fairly accurate investigations on the subject made in England and Germany lead one to believe that in these countries the annual abortion rate is not over 3 per thousand of the population. Since ethical standards are certainly as high in the United States as in the other two countries, and since economic conditions are better, it should follow that the abortion rate here is lower, for it rises with the economic pressure when other things are equal.

Whatever the rate in any country it is too high. Leaving moral considerations aside, the physical consequences of induced abortion are so distressing as to make it an economic crime. Whether it is increasing or decreasing in Europe and America no one can say with any definiteness. There are eminent authorities taking both stands. My own opinion is that it is decreasing in England, Holland, France, Australia, New Zealand, and the United States, due to the spread of the knowledge of birth-control methods. In most of the rest of the white world, where there is comparative absence of the use of contraceptives, it is probably increasing temporarily owing to the particularly depressing economic conditions existing during the past few years. It may be pointed out, however, that a rise or fall of 1 per thousand in the birth-rate means a change of between 3 and 4 per cent, while a shift of 1 per thousand in the abortion rate means a change of between 25 and 35 per cent. It therefore takes a relatively large change in the abortion rate materially to affect the birth-rate.

It is conceivable that these minor factors affecting the birth-rate adversely have a cumulative effect which in the aggregate is considerable. But in seeking the causes of the birth-rate decline in the immediate past, one must distinguish between their previous effect and their possible rise in effectiveness. In other words, one must ask how much greater their effect is to-day than it was half a century ago. Our answer to the question can lay no claim to demonstrable accuracy; but an estimate made after careful reflection attributes 85 or 90 per cent of the decline to artificial restriction of the family. The effect of the other factors is relatively small.

The indirect causes of birth decline, the causes which have induced the limiting of families, have been discussed frequently behind the pulpit and in the public press, where the vigor of the words does not always measure the intensity of the intellectual fire which moulds them. Much capital has been made of the woman who prefers a lap-dog to a baby, the woman who will not forego luxury for the sake of children, the woman who fears the loss of beauty. Every sin in the decalogue, and several new ones invented for the special purpose, have been laid at the door of childless women and of women who see fit to limit the number of their offspring. I was interested at one time in trying to find out how much of this criticism of the childless woman was sincere in its nature—without regard as to whether the premises were correct—and how much of it was a subjective emotional reaction due to causes that will readily occur to any psychologist. Among 25 individuals who were very outspoken on the subject and whose histories were readily available, 7 were bachelors, 5 were celibate clergymen, 3 were childless married women, 3 were persons with 1 or 2 children, 2 had 3 children, 2 had 4 children, 1 had 5 children, and 2 had 7 children. The result of this brief inquiry shows that a great part of this criticism is an insincere attack at an obviously vulnerable point. Personally, I believe that it is about as baseless as a political cartoon. People who do not desire children form a negligible fraction of the population. The parental instinct is too ancient to be changed easily, and it is seldom satisfied with the advent of a single child. The poor little lady riding around in a solitary grandeur would rarely hesitate a moment if she could exchange her jewels and her limousine for a child of her own to fondle; and it is a shame to cause her further heartaches by holding her childlessness up to ridicule. Her exuberant solicitude for her lap-dog, so much decried by her accusers, is clear evidence in her favor, if only they would be honest and admit it.

Deliberate childlessness in marriage is too unnatural ever to become common. Even the glorification of celibacy as taught by Saint Paul and approved by the Catholic Church has had no great influence on the rank and file of those professing the Christian faith. To be sure, the Church has been placed in a rather difficult position in this regard, as Havelock Ellis has remarked. It enjoins celibacy on its priests and forbids the practice of neo-Malthusianism by the congregation. No families is the command for the one, large families for the other. As Ellis says, "it is not easy, while preaching practical Malthusianism to the clergy, to spend too much fervour in preaching against neo-Malthusianism to the laity."[1] And, as a matter of fact, the fall in the birth-rate is as marked in Catholic countries as it is in Protestant countries, except where Catholic communities have been blessed with exceptionally favorable conditions.

Considering the birth-rate in its broad relation to other phenomena, one finds economic conditions to be the chief effective cause of its restriction. People limit fecundity for reasons connected with the family income, although restriction is by no means inversely proportional to the size of the bank-account. They persist in denying this, but their denials are not convincing. For example, 285 replies to Cattell's[2] inquiries among restricted families of American men of science elicited the information that ill health was the cause in 133 cases, expense in 98 cases, and other scattering causes in 54 cases. No one can look at these figures and believe them to be frank, unbiassed statements. They came mostly from college professors, notoriously underpaid for the requirements of their positions. Does any one familiar with the fact that college professors and their wives are considered particularly good risks by life-insurance examiners believe that half of them—somewhere around three times the proportion in the fertile part of the general population—are too weak and sickly to have more than one or two children? No, it seems to me more reasonable to draw conclusions from the trend of the birth-rate in whole countries. When one compares different countries, or different periods in the same country, the truth stands out. The main cause for family limitation is the economic cause; other causes are of minor importance.

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[1] Ellis, Havelock, *Essays in War-Time.* Boston: Houghton, Mifflin, 1917.

[2] Cattell, J. McK., "Families of American Men of Science," *Pop. Sci. Mon.*, 86: 504–515, 1915. *Sci. Mon.*, 4: 248–262; 5: 368–377, 1917.

Perhaps in part there is a desire in the parental mind to have a few children, together with comfort and an occasional luxury for themselves. But this is not the chief impelling cause for smaller families among the educated classes of Europe and the United States. Parents take their course for the sake of their children. They want their children to fare better than they themselves fared. They plan to usher them out into the world armored for its conflicts by a good education. They hope to leave them enough property to prevent a losing struggle in the economic competition which must come. In a word, their aim is to insure happiness, so far as lies in their power, for their own flesh and blood.

In the classes toward the lower end of the social scale to which birth-control is spreading in England, Australia, Holland, and a few other countries, the reasons are virtually the same in that they are economic. In part they are actually the same; but mainly they are due to the fact that children are no longer economic assets. So long as children cost little to raise until they were six or seven years old, and could then be put to work, the families were large. When child-labor laws came into being, the families became smaller. Indeed, Karl Pearson finds this to be the major reason for family limitation among the proletariat of England. And Arsène Dumont, who certainly could not be accused of any radical Malthusianism, comes to practically the same conclusion for France. Large families, he says, are only possible where there is no progress and no expectation of progress; small families become possible when the way has been opened, and there is hope of realizing natural aspirations toward betterment. Thus, as Havelock Ellis notes, the outcry against the falling birth-rate on the grounds that it de-notes a new selfishness replacing an old altruism is without foundation. It was a poor altruism which sent children when little more than babies to factories and mines where their souls were blighted and their bodies crushed, merely to increase the earnings of the family. And it was a bad government and a vicious system which made such an altruism more or less excusable by the conditions it maintained.

The birth-rate trend in the more important countries of Europe between 1870 and the beginning of the war in 1914 is shown in the following table.[1] In every country it has dropped, no matter whether the particular country concerned started with a high birth-rate or a low birth-rate; and the decrease is probably somewhat greater than the figures actually show, because of greater accuracy in registering births as time goes on. The first quinquennium cited, 1871–1876, shows Russia leading with a birth-rate of 50.3 per thousand of the population; next in order one finds Hungary, with a birth-rate of 42.8, Austria with 39.3, and Germany with 38.9; then comes a group consisting of Holland, Italy, England, Wales, and Scotland, each with slightly more than 35; then there are the Scandinavian countries, Sweden and Norway, with about 30; and finally

THE BIRTH-RATE TREND IN EUROPE
Per thousand of population annually

Years	England and Wales	Scotland	Ireland	France	Germany	Austria	Hungary	Italy	Norway	Sweden	Russia	Spain	Belgium	Holland
1871–76...	35.5	35.0	27.4	25.5	38.9	39.3	42.8	36.9	30.2	30.7	50.3	....	32.6	36.1
1876–80...	35.4	34.8	25.7	25.3	39.2	38.7	44.1	37.0	31.7	30.3	48.4	....	32.0	36.4
1881–85...	33.5	33.3	24.0	24.7	37.0	38.1	44.6	37.8	31.2	29.4	49.2	36.7	30.9	34.8
1886–90...	31.4	31.4	22.8	23.1	36.5	37.6	43.7	37.3	30.8	28.8	48.7	36.2	29.4	33.6
1891–95...	30.5	30.5	22.9	22.4	36.3	37.3	42.0	35.9	30.3	27.4	48.2	35.8	29.1	32.9
1896–1900.	29.2	30.0	23.1	22.0	36.0	37.0	39.7	33.9	30.3	26.9	49.4	34.6	29.0	32.2
1901–5....	28.2	29.2	23.3	21.5	34.3	35.7	37.5	32.7	28.6	26.1	47.7	35.2	27.7	31.6
1906–10...	26.3	27.4	23.3	19.9	31.7	33.7	36.7	32.7	26.4	25.4	45.5*	33.6	24.7	29.6
1911–15...	23.6	25.4	22.7	18.5	27.5*	30.0*	34.0*	31.4	25.2	23.1	....	30.8	....	27.7

* Approximately.

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[1] Holmes, S. J., *op. cit.* Checked with registrar-general's figures.

France with 25.5. When the period just before the war is reached the activity of the stork is much diminished. The order of the countries is about the same, but the percentage decrease among them is quite different. Russia still leads with a figure approximately 44, though no complete returns are available after 1909. Only Hungary, Austria, Italy, and Spain have kept the birth-rate above 30. In the remaining countries it has dropped to about 25 or less, with France bringing up the rear with a figure of 18.5.

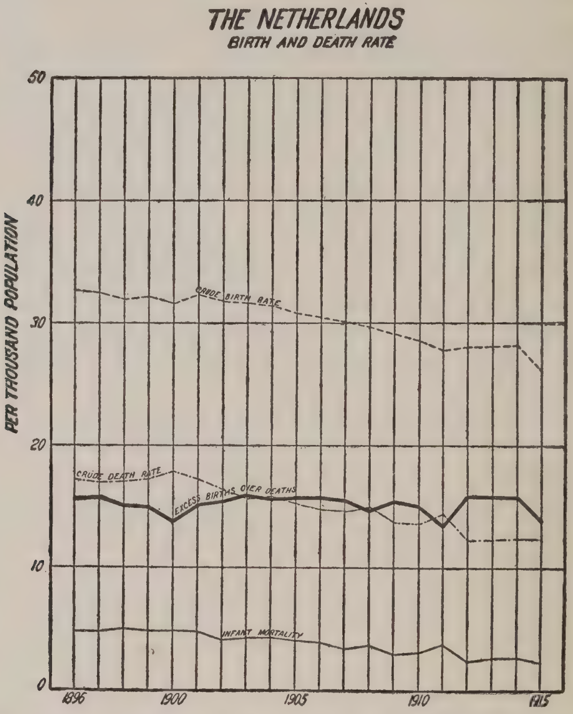

Fig. 16. THE NETHERLANDS: MEDIUM BIRTH-RATE, FALLING; MEDIUM DEATH-RATE, FALLING.
Compare with Rumania and Australia.

The United States shows the same course of events, though unfortunately no birth-rates comparable with those of the above table can be cited. The trend can be seen, however, in the census data compiled by Wilcox,[1] which show the number of children under 5 years of age for every 1,000 women between the ages of 16 and 44.

RATIO OF CHILDREN UNDER 5 YEARS OF AGE PER 1,000 WOMEN AGED 16 TO 44 YEARS IN THE UNITED STATES

Date	Ratio	Date	Ratio
1800..........	976	1880..........	635
1820..........	928	1900..........	541
1840..........	835	1920..........	467
1860..........	714		

Such figures as these have been the tangible material for the use of the croaker. By assuming a continuous future decrease in the relative number of births at about the same rate, he is able to set the date when there will be no more children. But birth-rates mean little by themselves. The excess of births over deaths is what counts; and when one studies such figures he finds that falling birth-rates have as yet made no material change in the rapidity of population growth in the white world. The war produced a temporary depression in European growth, it is true; but the returns for 1920 and 1921, incomplete though they are, show that with the exception of Russia, Austria, and possibly France, growth is now back on the old basis. Indeed, German increase in the last two years appears to be greater than it was in 1912 and 1913.

Let me emphasize again the fact that the researches of Knibbs and of Thompson, as well as my own investigations, show the growth of world population for the generation previous to the World War to have been greater than for any similar period in former times, unless one allows for unrecorded catastrophes of extreme magnitude. If one studies the rate of growth in various countries during this generation, therefore, he is in a position to draw some very interesting conclusions regarding population prospects in the immediate future, despite the admitted deficiencies in the vital statistics used and despite the errors which arise from accepting uncorrected birth-rates and death-rates.

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[1] Wilcox, W. F., "The Change in the Proportion of Children in the United States," *Amer. Stat. Assn.*, 12 : 490–499, 1909–1911.

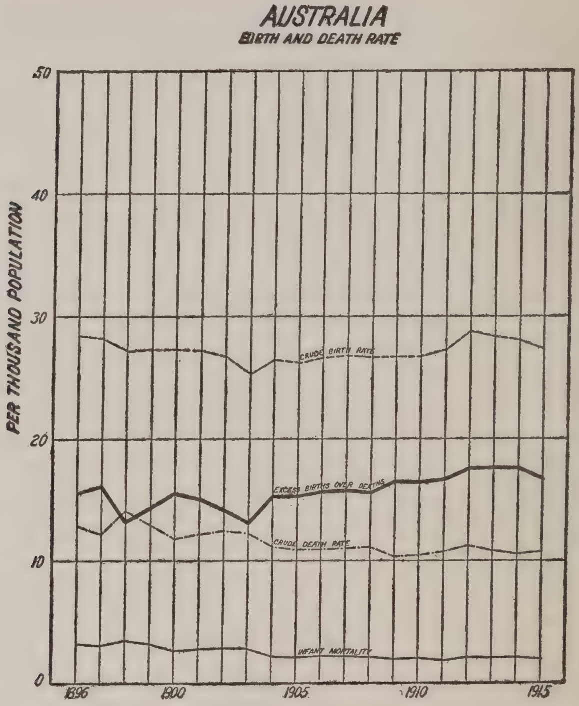

Fig. 17. AUSTRALIA: LOW BIRTH-RATE, CONSTANT; LOW DEATH-RATE, DIMINISHING SLOWLY.

Natural increase approximately same as in Rumania, where high birth-rate persists.

The following table[1] gives the average annual excess of births over deaths for 15 countries during the last pre-war quarter-century divided into 5-year periods. The data cited include those for nearly all the countries of Europe, and in addition those for the commonwealth of Australia. For the averages for the last quinquennium, the available figures include only 4 years in the case of Germany, 3 years with Austria, Belgium, and Hungary, and 2 years with Bulgaria. No figures have been published for European Russia later than 1909.

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[1] Compiled from the registrar-general's figures.

EXCESS OF BIRTHS OVER DEATHS IN VARIOUS COUNTRIES
Per thousand of the population
Averages for five-year periods

Years	Australia	Austria	Belgium	Bulgaria	Denmark	France	Germany	Hungary	Italy	Norway	Rumania	Russia	Spain	Sweden	United Kingdom
1890–94...	19.7	9.0	8.7	9.7	11.4	0.1	12.5	9.0	10.5	13.0	9.1	12.1	3.8	10.6	10.7
1895–99...	15.4	11.4	11.1	15.9	13.7	1.3	14.8	11.4	11.1	14.8	12.9	16.6	5.7	11.2	11.1
1900–4.....	14.6	12.1	10.7	17.7	14.0	1.4	14.5	11.9	10.4	14.4	14.0	17.7	8.3	10.7	11.1
1905–9....	15.7	10.8	9.0	19.0	14.3	0.6	14.0	10.9	10.9	12.5	14.2	16.1	9.2	11.0	11.1
1910–14...	17.1	10.5	7.6	18.6	13.5	0.4	12.5	12.8	12.8	12.2	17.4	....	8.9	9.8	10.0

Any one who sees white stagnation in this table needs a new pair of spectacles. The Stork may have become less active, but the inertia of Death has more than made up the difference. The weighted average, that is to say, the average based on the size of the respective populations, is manifestly higher in the last quinquennium than it is in the first. During the period 1910–1914 the average annual growth, assuming the rate in Russia to have been not less than 15, is certainly not lower than 13.5, and it may have been as high as 14.5. During the first five-year period, 1890–1894, the weighted average annual growth was not over 11 per thousand of the population.

The differences in the general trend of population growth in these various countries during the quarter-century cited lead to some very pertinent inferences. In Australia the birth-rate during the first five-year period averaged 33.4 per thousand annually. During the last five-year period this average had fallen to 27.8, a drop of 5.6 per thousand.

Nevertheless, the excess of births over deaths was only 2.6 per thousand less in the second period than it was in the first. Thus this new country with great per capita wealth, where economic competition is low, has been able to maintain a rapid increase of population on a relatively low birth-rate. In Belgium, on the other hand, though the trend of the birth-rate until the last quinquennium parallels Australia almost exactly, there was no such opportunity for a mounting population unless it had been continuously relieved by emigration. The country is overcrowded; and no matter how hard the thrifty energetic people work, they can only make room for a limited number of newcomers.

Similarly, the effect of economic pressure is manifest in the course of the population in every other country. Take first the group where the population is relatively dense, Austria, Denmark, France, Germany, Italy, Norway, Spain, Sweden, and the United Kingdom.

Austria and Germany have kept up their natural increase successfully. They have been able to do this because of the industrial activity of their capable, efficient people, and because they have sent out colonists by the thousand. Yet neither religious command nor military zeal has been able to keep up the birth-rate. It has declined in both countries. All that expansionistic propaganda could do was to send down the death-rate simultaneously. And it is an interesting comment on the situation that imperial Germany, more progressive and scientific than German Austria, was able to keep up a faster growth with a lower birth-rate, even though Austria sent out the greater proportion of emigrants.

The Scandinavian countries, also, though starting with comparatively low birth-rates and ending with lower ones, managed to keep their growth almost constant and at a rather high rate. Considering the three countries together there has been a slight decline, but it is insignificant. One can see in the figures the history of an energetic people placed on an inhospitable soil. They have progressed by industrial and agricultural specialization. The specialization of Norway and Denmark particularly has been in the way of producing more food by importing animal feeds and selling high-grade animal products. Probably this alone accounts in large measure for their ability to increase their numbers faster than Sweden. In addition, Sweden in recent years has sent out proportionately less colonists than either of her neighbors.

Italy, forced to curb her industrial ambitions by lack of coal and iron, has been able to keep up her natural increase during the time in question solely by sending out emigrants. Italy shipped her people to foreign parts relatively faster than any other country.

Spain is seen to be growing twice as fast in 1910–1914 as in 1890–1894, but even at the later date her increase is lower than that of any of the other countries considered except Belgium, during the last quinquennium, and France. No doubt Spain has progressed in public health measures, for her death-rate has been dropping; but the effective final cause for the showing of Spain in this regard is her awakening to better methods of agriculture, and to transportation and preservation of agricultural products.

France was still growing slowly when the war came upon her. But if France can be reasonably certain of peace, her people will prefer the relative comfort which existed in the latter part of the nineteenth century when they had the highest per-capita wealth in the world, to a greater natural increase in population combined with the enhanced economic pressure which it brings.

The United Kingdom may be expected to continue to grow, but with a diminished rapidity. Britain has been fortunate. Controlling much of the underpopulated portions of the earth, she has had an opportunity for expansion denied to most other nations. Her capable industrious people have built up an enormous commerce with the colonies, and have thus been enabled not only to increase far beyond the food capacity of the motherland but also to help populate the overseas empire by emigration. But both of these means of providing for excess population must gradually diminish and finally disappear as the foreign dominions fill up with people. When that times comes, and it will not be long until it does come, the United Kingdom must keep the population stationary—and stationary at much lower numbers than are housed at present. Unless there comes some unforeseen radical improvement in agriculture, 35 million people is pretty close to the maximum population for home maintenance.

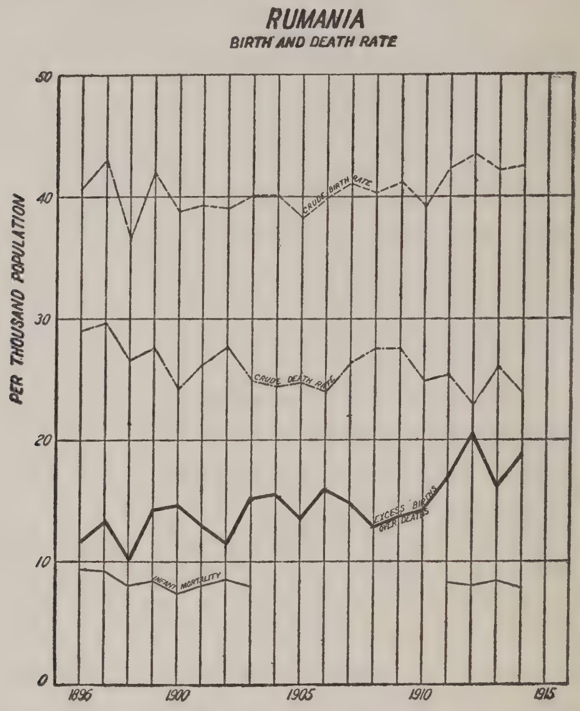

FIG. 18. RUMANIA: HIGH BIRTH-RATE, CONSTANT; HIGH DEATH-RATE, DIMINISHING.
Approximately same increase as the Netherlands and Australia.

Now turn to the group of countries agriculturally underpopulated, Russia, Rumania, and Bulgaria. One may also include Serbia, since her vital statistics are comparable with those of Rumania. In each of these countries there has been a tremendous population expansion; and the reason for it is not hard to find. In the latter part of the nineteenth century these agricultural nations were backward. Their development was slow. Then came the efforts of the progressive industrial nations, Germany, England, and the United States, to build up their foreign trade, and eastern Europe was set down as a likely market. The result was a rapid change in this part of the world. Agriculture was revolutionized by the introduction of modern machinery, which permitted a wonderful increase in the amount of land cultivated per unit of man-power; and exchange was facilitated by increased railroad mileage. Hand in hand with these changes came a speedy increase in population, just as it had come in the United States forty years earlier for the same reason. There was more available food, whereupon there arose more people.

In all of these countries, therefore, there is virtually the same story. They are more or less unconsciously maintaining as high a rate of population increase as is possible under the economic conditions existing, and economic conditions have been relatively better than they were in the past. With the sole exception of France, each country is expanding as rapidly as it can. The variations in the rate of expansion are attributable only to the varying density of population, the natural riches of the country, the provision for emigration, and the efficiency of the people. Certainly they are not dependent on the birth-rate, for in no country other than France has the birth-rate fallen to a point where a low death-rate in an expanding population could not give a natural increase of at least 15 per thousand annually.

The vigor of Europe is probably nowhere better illustrated than by the vital index (100 births/deaths) for England and Wales during the past fourscore years, as worked out by Pearl and Burger.[1] Their statement on the matter follows:

Period	100 Births / Deaths	Period	100 Births / Deaths
1838–1839........	140.28	1880–1884........	171.81
1840–1844........	148.04	1885–1889........	169.85
1845–1849........	139.61	1890–1894........	161.48
1850–1854........	151.69	1895–1899........	166.40
1855–1859........	155.23	1900–1904........	171.25
1860–1864........	157.30	1905–1909........	177.40
1865–1869........	157.11	1910–1914........	175.09
1870–1874........	161.35	1915–1919........	134.95
1875–1879........	167.69	1920.............	205.48

It is at once apparent that *the ratio of births to deaths in England and Wales had a slow but extremely even and steady increase from 1838 to 1914.* This steady progress was interrupted to a degree sufficient to be apparent upon only two occasions during the three-quarters of a century. These were in 1847–1849 and 1890–1894. These fluctuations which only slightly affected the even upward trend of the curve were due to the influenza pandemics of 1847–1848 and 1890–1891. The broad result is perfectly clear and outstanding. The population of England and Wales is to-day biologically fitter and possessed of greater purely biological survival value as a whole population than it was three-quarters of a century ago. Whether it is a mentally, morally, or anthropometrically fitter population does not now concern us. We are dealing at the moment solely with the fact that, taking the people of England and Wales as a whole, slightly over two babies were born for every death in the year 1920, as against 1.4 babies per death in the year 1838–1839.

Now this result, which is beyond any question a fact, will strike any one informed as to the sociological and eugenical literature of the last two decades as curiously at variance with the tenor of that literature, taken as a whole. It has been pronounced from high places that the general trend of the British people was biologically downward, that they were in fact becoming biologically dangerously near to a decadent race. Abundant quotations in support of this contention could be cited were space available and were it necessary. This gloomy view has had its foundation solely upon the fact that, since the quinquennium 1875–1880, the birth-rate in England and Wales has been falling rather rapidly. But from a purely biological view-point, what matters a falling birth-rate if the death-rate falls even more rapidly, so that the net survivorship at any instant of time is constantly getting higher?

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[1] Pearl, R., and Burger, M. H., "The Vital Index of the Population of England and Wales, 1838–1920," *Proc. Nat. Acad. Sci.*, 8: 71–76, 1922.

It is natural to ask how the Great War affected these trends. Many believe that the after-effects of this war will be unlike the after-effects of previous wars, in that the birth-rate will continue to be depressed below pre-war figures. Personally, I do not believe that this will be the case. I believe we may read the future in the past, and that the birth-rates will take such upward trends in the war-stricken countries that in a very few years they will fit projections of the pre-war curves. In other words, I believe it to be a fair prediction that as far as gross natural increase of population is concerned, the curve for Europe when plotted from 1900 to 1950, if that be some day possible, will show only a temporary deflection for the years 1914 to 1920. There are three reasons for making this prediction. In the first place, the wars of the sixteenth and seventeenth centuries were far more disastrous to Europe than the World War in proportion to the then existent population. More people were killed in battle, and the economic after-effects were more distressing; yet Europe recovered, prospered, and expanded in a most extraordinary way a century later. In the second place,I have a thoroughgoing faith that Europe, now in the hands of democracy, will cement together the broken pieces of her economic system in such a manner that it will be stronger than ever before. With sound business policies, and with stable governments promoting the food-supply both directly and indirectly, and with science cutting down the death-rate, it will be impossible for the natural increase of population to remain at the low war-time figure. It will rise in spite of everything, until the world as a whole becomes more nearly saturated with people. In the third place, the fragmentary vital statistics which are now being published from time to time show that Europe is coming back rapidly. Germany, England, and the neutral countries, in spite of economic depression, are to-day practically on a pre-war basis of population increase. So too, if one may believe reports, are Poland, Czecho-Slovakia, Hungary, Rumania, Bulgaria, and Jugo-Slavia (speaking now by the post-war map). The recovery of Italy, Greece, and Austria has been delayed, but the tide has passed the ebb and is flowing back. The time of Russia's rehabilitation is the only unknown quantity. Russia has suffered grievously and long. Her actual war losses were as great as those of either France or Germany, and her losses from influenza and from malnutrition have been enormous. Nevertheless, Russia's debacle has been greatly exaggerated in the minds of most European and American readers. The total losses due to the war and to the economic chaos later may have been as high as 15 million people—though they may also have been as low as 8 million people. In addition, the birth-rate has undoubtedly dropped over the whole country. In spite of all this, there is scarcely the shadow of a doubt but that Russia now contains between 8 and 14 million more people than it did in 1915. The population of European Russia, excluding Poland and Finland, was slightly under 132 millions in 1915. In August, 1920, according to *The Statesmen's Yearbook,* a census by the Russian Soviet Republics[1] gave the figures 136 millions for that part of the old Russia which had been retained. Even at that time, therefore, Russia contained 8 or 10 million more people than in 1915, when calculation is made on equivalent land areas. Thus it is not a mere assumption to say that whenever Russia's government is stabilized, and hope once more gladdens the hearts of her sturdy peasants, just then will Russia renew the rapid increase in growth which was hers during the last three decades before the war.

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[1] There is a difference of opinion here. *The Literary Digest* for January 6, 1923, quotes Mikhailovsky, director of the Central Statistical Office of Russia, as believing that between 1914 and 1920 Russia actually lost 9,000,000 people, besides a possible loss due to diminished excess of deaths over births. But, in the first place, 2,000,000 of this loss was by emigration and does not count. The estimates of 3,500,000 lost by war and 3,500,000 by the excess mortality of epidemics are probably fairly close to the truth. The other side of the population question is not considered, however. The idea that the Russian death-rate has equalled or exceeded the birth-rate comes largely from urban records which are always affected most adversely by such conditions as have existed in the country during recent years. If vital statistic records were available for rural districts, I am inclined to think that a different story would be told. On the whole, therefore, I favor acceptance of the figures given in the text until there is reason for rejecting them.

Since the natural growth of the population of Europe and of the descendants of the people of Europe had increased during the generation previous to the war in spite of the diminished birth-rate, it is quite evident that depopulation in the white race is not imminent. Its growth is so much greater than that of the brown, the yellow, or the black races, it simply must come to a numerical majority in the world in an exceedingly short time. Even should the birth-rate continue to decline and the death-rate remain stationary, the inertia, so to speak, of white increase would carry it on during the next half-century; and this half-century of increase is all that is necessary to bring about a population pressure more general and more serious than the race has ever known. It will bring about a pressure more nearly comparable with what has been experienced in China during the last few generations.

For this reason there can be no "Crisis of the Ages" in the nature of an aggressive war waged by the colored races against the white, as assumed by Mr. Stoddard.[1] The white race is coming to be too numerous. It holds too much land. It has too much brain power. But there can and will be a crisis for the white race raised by its own improvidence, unless the birth-rate is cut down still more rapidly than it has been in the immediate past. In other words, the momentum of white-race increase is going to carry it beyond the point of a reasonable saturation for the temperate lands it holds. I calculate that if the birth-rate diminished at a rate comparable with that of the last quarter-century, and that if there were continued progress in cutting down the standardized death-rate due to the spread of public hygiene, it would take a century and a half to reach the point where the natural increase had been reduced to about 3 per thousand. Yet within half a century the white race will have expanded to such figures that the land it holds in the temperate zones will be filled. This means that when the race has reached hailing distance of a real saturation point, it will still have an annual birth-rate somewhere between 5 and 8 per thousand too high, and the death-rate will have to reach up to meet the difference.

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[1] *The Rising Tide of Color.*

In making this calculation I have made no such rash assumptions as were made by Doctor Drysdale[1] in his testimony before the English Birth-Rate Commission, when he assumed that the death-rate could be reduced to 4 or 5 per thousand. There have been crude death-rates as low as 9 per thousand over a few years, and from this fact he assumes a death-rate of even less than 4 per thousand as a possibility with an average length of life of 80 years and a slowly *increasing* population. But Drysdale is twisted in his mathematics, not to speak of his placing the average longevity at nearly a score more years than there is any warrant for assuming. Populations cannot *continue* to *increase* at even a death-rate of 10 per thousand. As we have already shown when a population approaches the normal distribution of ages compatible with an average longevity of 60 years (which is reasonable) and is practically stationary in numbers, there is no hope for a death-rate of less than 16 per thousand, and this only with utmost medical effort and with economic safety. About 16 per thousand, then, is the birth-rate which must be retained ultimately in order to prevent depopulation.

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[1] See the reports of the English National Birth-Rate Commission. *The Declining Birth-Rate.* N. Y.: Dutton, 1917. The second report is also valuable. *Problems of Population and Parenthood.* London: Chapman and Hall, 1920.

Our conclusion, therefore, is that the white birth-rate should drop nearly twice as fast as it is now dropping when conditions are normal in order to arrive at a stationary population before the saturation point is reached. Only then can the positive checks to population, which are otherwise due to mount to higher peaks, be circumvented. This is a radical conclusion, which may arouse doubts even in the minds of those who are not imperialistic, but who fear depopulation and a dying race. It will certainly be criticised by those who, like the French politicians, have fears for the national safety. There is no reasonable basis for anxiety in either case.

The normal unrestricted birth-rate in an underpopulated country at the average rate and age at marriage now current in the white race is probably 50 per thousand and is certainly not less than 40 per thousand. This birth-rate can be cut to at least 26 per thousand, and presumably to a lower figure, without lowering the natural increase of population. Growth is even greater during the process, as is seen in the statistics shown in the table on page 271. This phenomenon is due to the high correlation between birth-rate and death-rate. In the countries where the birth-rate is high, the death-rate is high. In the countries where the birth-rate is low, the death-rate is low. I do not say that the whole of this correlation is due to the relationship between birth-rate and death-rate, although such dependency is maintained by all thoroughgoing neo-Malthusians. It is more rational to suppose that the association is partly due to causes affecting both rates in a similar manner; but at the same time there must come a time, even within a nation, when a higher death-rate obtains in large families than in small families simply because the former cannot have the care and attention which can be given the latter. The international correlation between the birth-rate and the death-rate is a simple fact.

Cut the birth-rate below a certain point, however, and the rate of population increase must diminish. One must not blind himself to this fact. The birth-rate and the death-rate are comparable only up to a certain point. The death-rate in a stationary or a diminishing population cannot fall below 16, let us say; the birth-rate, theoretically speaking can fall to zero. But at this point it is wholly a matter dependent on the economic situation, in my estimation. The birth-rate will never fall below a figure which will replace the current population with a generation wherein each individual has a reasonable chance for comfort. The parental instinct, the love of children for their own sake, is much too strong. What is less probable is that the birth-rate will ever be restricted to a point where opportunity for each newcomer will be insured. Naturally, when world saturation is reached, there will be birth-rate fluctuations dependent directly on variation in conditions. In periods of particular stress it will fall; when conditions become better it will rise. But there need be no morbid fears that people will suddenly cease to have children after millions of years of evolution based primarily on sexual reproduction.

There is an economic phase of the problem, however, which may cause some minor changes in our political world. To-day, in every nation, the people are crushed by taxes. Not less than 25 per cent of all incomes, directly or indirectly, go for governmental activities. In part this is due to the complexity of modern society, in part it is the result of waste and war. Whatever the reason for them, they form a heavy burden. In direct taxation, the desirable citizen striving to replace himself and wife by healthy children well prepared to carry on for civilization is penalized. His taxes are proportionately higher than those of the unmarried and the childless. This must be remedied; but it must not be changed by any such quack medicaments as "bounties for babies," whereby the improvident couple is led to spawn incompetents on the world *ad libitum* and is rewarded for the crime. A real remedy will be needed, with some thought and knowledge behind it.

Those with political fears must also cast about for a remedy other than overpopulation. Small countries cannot provide against aggression simply by filling their lands to overflowing, unless it be by making their country so undesirable that it attracts no covetous eyes. Eventually the people of the earth may become one nation, as is preached by Mr. H. G. Wells; but until they do, there will always be larger nations and smaller nations. Physical barriers alone prevent countries from being standardized in size. This being true, unrestricted birth-rates will only promote war, and will not serve to protect the weaker nation. Pearl[1] has intimated that France took the wrong course for political safety by restricting her population to 40 millions, with an enemy on the eastern horizon having a population of 65 millions. Possibly it is true that a duel between France and Germany without allies would have resulted in the triumph of Germany; but it is just as probable that defeat would have been the portion of France in any event had she stood alone, simply because the arable land of Germany is capable of supporting some 10 million more people than that of France. In other words, as between countries where the people have equal capacities in military matters an unrestricted birth-rate will not save the smaller.

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[1] Pearl, R., "Natural Death, Public Health, and the Population Problem," *Sci. Mon.*, 4 : 193–212, 1921.

CHAPTER X

THE BIRTH-RATE AND SOCIAL PROGRESS

Some few years ago a man who had dedicated his life to bettering social conditions vehemently announced his bitterness toward eugenic ideas somewhat as follows: "Heredity! Heredity! The word has rung in my ears until I am sick of it. There is just one heredity in this world of ours —we are the children of God." The audience showed their approval of this burst of emotion by prolonged applause. The press gave the incident extended and appreciative notice.

At nearly the same moment a benevolent-minded layman who had never been adorned with the academic robes of a doctor of medicine stood before the bar of justice arraigned for treating a diphtheria-stricken child with an unorthodox medicament. He defended his action by claiming to be called of God to heal the sick. The needless death was a manifestation of God's infinite wisdom. The judge was not impressed. Part of his charge was given in virtually these words:

> Society has found it necessary to protect itself from such as you by establishing medical schools wherein those who would presume to heal the sick must learn the secrets of Nature which God put it into man's power to discover, and which he has discovered. It is not always given man to know the voice of God. What you thought was the voice of God may have been the echo of your own egotism.

Doubtless the bailiff had to proclaim "Order in Court" to stifle popular approbation of his Honor's reprimand. It would be so, even if the same audience had been present as before. People do not see the similar audacity of ignorance in the two cases. To them the one is an amiable warmhearted altruist, the other a dangerous charlatan; yet the underlying emotions prompting these two men to take their respective rôles were probably identical. Both undertook to diagnose ailments and to prescribe remedies, the one for the ills of an individual, the other for the infirmities of a group. Neither was prepared for his task, but the fact took on importance only when the results of failure could be perceived and measured by even the most commonplace mind. Does it not seem most extraordinary that our civilization should require four years in a medical school in order to make certain that a would-be practitioner has imbibed a smattering of the few facts known about the human body in health and disease, and should encourage any one who feels the impulse to practise the art of healing on the huge, complex, ever-ailing body of modern society without any preparation whatsoever?

The contrast in the returns from the two types of work may be due to just this difference in the attitude of the public. Medical effort has been crowned with success, social betterment has come perilously near to being a complete failure. Wherein lies the cause if not in the way knowledge has been sought and applied in the one case and avoided in the other?

When one brands social-betterment work as a failure he means, of course, that the organic weaknesses of society have not been abolished or even alleviated by the frantic exertions of organized charity or the Utopian schemes of political idealists. There have been changes in the social order which are very desirable; but very largely they are temporary changes made possible by the favorable economic situation of a world as yet unaffected by universal population pressure. Society has merely utilized the general spread of education, which brought about so many accretions to knowledge, as a means of profiteering on natural resources. Mechanical inventions increased man's ability to exploit the earth's riches a hundredfold in less than a century. For the time being, efficiency rose faster than numbers; and this situation furnished a delightful opportunity for indulgence in high living, which society seized immediately. In goodly proportion, it lives in fine houses, wears rich clothes, and dines well. It cultivates the arts, drives to office, and works short hours. But this imprudent extravagance should deceive no one. It does not come as the result of permanent social progress. Rather it is on a parity with the drunken revel in silks and furs staged by the war profiteers in 1918, and its final result will be simply to multiply the difficulties to be experienced in the readjustment which must come during the next century due to the approach of world saturation in population. Behind all this pomp and circumstance which would dazzle any previous age, it is the same old unhappy society, full of inherent defects impossible to hide from the prying eye. Its structure has not been affected; the spread between misery and comfort remains the same; the relative proportion of distress and affliction is unchanged.

Why has there been this lack of success in dealing with the fundamental social problems? Simply because the plaudits of the world have been for the gentleman who said there was only one heredity. In addition, which makes matters worse, it has been generally agreed to deal with the primary instincts as if they could be shifted about, subdued, or even wiped out, by phrase-making. With a colossal stupidity our industrial relations, our domestic affairs, and our educational systems have all been conducted on the supposition that we are mechanical automata instead of human animals; and the reforms usually suggested show no greater insight. The aristocratic and bureaucratic régimes of the past and present have been carried on as if self-preservation was the sole incentive to human activity; the socialistic proposals stimulated by this very instinct, made acute by unsatisfied wants, have often been formulated with the tacit assumption that it does not exist at all, for the individualistic is to be merged in the communistic. Both types of administration refuse to consider the relations between the sex instinct and the hunger instinct in their effect on social conditions, and both take the word "inheritance" to be merely a legal term having to do with property. Such attitudes are pitifully at odds with reality. There is no hope for real social reform until we learn that all doctrines must fail which do not square with both the hunger and the love instinct, and not with one alone; until we realize that heredity does rule the destinies of men, with environment only such a factor as the chemical developer, capable of bringing out the image on the film but incapable of creating it. So long as we work by rote on the basis of other assumptions our efforts result only in social sabotage. It is too bad all of us cannot be apprenticed to agriculture long enough to learn that the way to get a high-grade human stock is essentially the same as the way the farmer obtains his high-grade steeds. The latter worthy long ago lost faith in the curry-comb and the oat-bin as a producer of prize-winners. He pins his faith to the blood of Hambletonian Ten, or sires and dams of equal merit.

Some one, I do not remember who, has said that the most uncharitable of persons is he who throws a coin to a beggar. If he would be truly charitable, let him inquire into the causes promoting beggary and take steps to eliminate them. We have been the coin-flingers. The "we" is editorial, and all-inclusive; America has been no better and no worse than the rest of the world, though there has been a peculiar childlike blandness here in the way social matters are approached. One of the most complacent follies is to suppose that the comparative freedom from past unrest is due to a superior wisdom by which the people conquer in anticipation the various difficulties which so perplex other parts of the world. Periodically the editors compose sermons stimulated by economic or political crises in other climes, reiterating this refrain. In reality, the situation is more worthy of thankfulness than of braggadocio; it has been due to luck, not wisdom. Freedom from stress came from low density of population and great natural wealth, and cannot last forever. To-day, in fact, the point has been reached where disorder appears more frequently. Strikes and lockouts are commonplace, and anarchistic propaganda is wide-spread. The country is becoming older; the pains of age begin to replace the health and vigor of youth. The time arrives, then, when we shall need all the wisdom we possess.

This point marks the end of a stage of social development through which several portions of Europe passed a generation or two earlier. It is unfortunate for us, perhaps, that European experience did not come much sooner; America might have profited. In what may be called "social age," however, Europe is not very much older than America. When the industrial era was opened in the early part of the nineteenth century every nation had the opportunity—though all did not accept it—of quaffing a tonic which had the peculiar power of levelling the ages of its users for a time. Aged countries, like England, France, and Germany, were rejuvenated; youngsters with vigorous metabolisms, like America, grew so fast they almost overtook their elders. Northern and western Europe, therefore, only a generation ago passed the stage when it could avoid the responsibility of solving social problems by throwing coins to that stolid, sodden part of humanity which had no capacity for analyzing its fate; and America has now reached the same position. The changing economic situation here is producing, as it produced across the water, an ever-increasing proletariat with thinking leaders who are demanding action.

But the majority of these leaders, thoughtful though it is, appears to lack vision. It devises nothing newer than a more extensive orgy of organized charity, and a revision of the current method for dividing the world's goods. It proposes to sublimate the acquisitive instinct to such an extent that no man will demand more than another, at the same time denying that relative density of population has a bearing on the practicability of the proposal. Only the minority demands biological reform. This minority appreciates the desirability of certain changes in social relations which will guarantee to every man the opportunity of achieving all that he is capable of achieving and a just return for what he does achieve; but what it holds to be fundamental is a change in the constitution of society itself, which can only come about if there is a new attitude toward the problems involved. The change in mental perspective desired is the admission that the self-preservation instinct will not permit a thorough development of plans for the common good, unless the individual survival struggle is made less intense by permanent restriction of the population far below the maximum which it is possible to support. The change in constitution needed will follow when those of meanest ability no longer outbreed the rest.

There is a fundamental difference in these two modes of approach. The euthenist sees a perfect remedy for all social ills when every individual obtains just treatment by his fellow men. He is satisfied with externals. The eugenist believes that charity begins at home. He maintains that part of the present-day burdens should be shouldered by ourselves rather than laid at the door of others. Oddly enough, there are some peculiar partners in these confessions of faith. With the euthenists are ranged stand-pat conservatives, who, while admitting an imperfection here and there in the social system, are afraid that changes may lead to something worse. Hand in hand with them go radicals who are ready to try any ill-advised scheme on the ground that innovation must be for the better. The eugenists are similarly divided, though not quite so sharply. They number in their train conservatives who preach mildly to the educated, whom they make the mistake of thinking are always the well endowed, that they must have more children and thus counteract this terrible differential birth-rate so long in favor of the poor and lowly. The radicals view such recommendations with contempt. Be practical, they advise; solve the population problem at the same time you alter the differential birth-rate. Teach *all* people to limit their families in accordance with the mother's strength, and with due regard for the fundamental right of every child to receive a healthy start in life and an opportunity for development, and you will have made possible a social advance which can come about in no other way.

It is difficult to understand the mental reactions of the euthenical social radicals, so much more difficult than to understand the political and clerical conservatives. Conservatism comes to those who have arrived. They wish to preserve the fruits of their success. Having been for many years in that position of detachment from worldly affairs which the cartoonist pictures as one of the privileges of academic life, I have witnessed this development of conservatism time and again. Youngsters, full of enthusiasm, demand all sorts of reforms in all sorts of things, politics, religion, business, and what-not. They are for the under dog now and always—being themselves under dogs without being aware of the fact. But let them have a few glimpses through the door leading to Success and the tune changes. The office-boy, who has become the factory manager, becomes very critical of the demands of the working man. The little merchant, who by dubious methods has become the big merchant, changes to a rock-bound pillar of business ethics. And so it goes. It is, as I say, easy to read these people; self-advancement dominates every action. Though their position is logically unsound, they feel dimly that eugenical measures will render their position insecure by raising the level of intelligence and by increasing the opportunity of those whom they have previously exploited. But why is it that members of the proletariat, who are dominated by the same basic instinct—for they are the underlings who want to become the upperlings—often take an attitude regarding population problems which leads to the same result as that of the conservatives?

Perhaps the situation is all due to the single leadership of the author of the *Working-class Bible.* Mrs. Sanger[1] believes this to be the case. She says the gospel of Marx has been too long and too thoroughly inculcated into the minds of millions of the workers of Europe to be easily discarded. "It is a flattering doctrine, since it teaches the laborer that all the fault is with some one else, that he is the victim of circumstances, and not even a partner in the creation of his own and his children's misery. The Marxian influence has tended to lead workers to believe that, irrespective of the health of the poor mothers, the earning capacity of the wage-earning fathers, or the upbringing of the children, increase of the proletarian family was a benefit, not a detriment to the revolutionary movement. The greater the number of hungry mouths, the emptier the stomachs, the more quickly would the 'Class War' be precipitated. The greater the increase in population among the proletariat, the greater the incentive to revolution." "This," she adds, "may not be sound Marxian theory, but it is the manner in which it is popularly accepted." Not all socialists hold such beliefs, but by and large their proposals to cure social ills are too one-sidedly economic. They expect to rejuvenate a tottering society by dressing it in swagger clothes without much thought as to who will furnish the festive raiment.

I take it that no one in this era can object to the whole of the socialistic view-point. Our schools, parks, museums, libraries, hospitals, and many other desirable public works are the result of accepting a socialistic trend for society. In fact the whole tendency of modern government is from the paternalistic to the socialistic, though it is apparently turning from the one to the other rather without purposeful directive effort. Enhanced industrial efficiency gave the underman the opportunity to acquire a small modicum of education, while at the same time it permitted him to outbreed the overman; and as the climber became more and more aware of his latent powers, he demanded a greater and greater share in his own government. Democracy was then cultivated because theoretically it gave the proletarian a place among the rulers, though in truth only allowing him to applaud a new set of dominating individuals who were fundamentally as selfish as their prototypes, the autocrats. The underman did gain something by democracy, however; his latest masters set themselves to render their power secure by placating him with an occasional reward for good behavior. Thus there came about a social evolution which possesses some very desirable features, and which have met many of the exigencies of the times. Nevertheless, the new social policies are just as unsound biologically as they have ever been. Man has kept on promiscuously filling the vacant corners of the earth, without an eye for the future, and without any plan or desire for betterment; and his troubles, his real organic troubles, have augmented as the natural result. It has seemed as if he were emulating the dinosaur which, seizing the opportunity for a specialized evolution made possible by temporary conditions, grew so large that it failed in the survival struggle because of its very bigness.

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[1] Sanger, Margaret, *The Pivot of Civilization.* N. Y.: Brentano, 1922.

The faultiness of these past changes and of the present proposals to bring peace, prosperity, and good-will by equal distribution policies—and essentially all socialistic policies are such—ought to be obvious to every one. In the first place, one should realize that the instinct for self-advancement is too primordial for elimination. Man will unite for the common weal only to such an extent as will promise him individual security. Individual security for the weak, therefore, since it depends on the benevolence of the strong, can come only when there is no killing competition for means of subsistence among all classes of the people. Thus it follows that socialistic proposals for an even-handed distribution of the products of industry can be put in practice only in a world unsaturated with population, and then imperfectly; and this makes it imperative that there shall be such restrictions on the reproductive instinct as will prevent the evils which inevitably follow the lack of control, if there is to be any considerable merging of the individual survival instinct into the communistic. In the second place, it must be recognized that there are huge differences in inherent capacity among human beings, and that the general level of ability can only be raised by use of the stockman's method, good breeding. These two propositions are the biological propositions of the minority of to-day. They are so simple, so axiomatic, that one hesitates to present them as the fundamental requisites for future social betterment, but such they are.

These are eugenical methods, but they are not the eugenical methods usually proposed. In Mrs. Sanger's recent book, *The Pivot of Civilization*, the common type of eugenics is given an indictment which is unquestionably fair and to the point. Her words are as follows:

> Eugenics seems to me to be valuable in its critical and diagnostic aspects, in emphasizing the danger of irresponsible and uncontrolled fertility of the "unfit" and the feeble-minded establishing a progressive unbalance in human society, and lowering the birth-rate among the "fit." But in its so-called "constructive" aspect, in seeking to re-establish the dominance of healthy strains over the unhealthy, by urging an increased birth-rate among the fit, the Eugenists really offer nothing more far-sighted than a "cradle competition" between the fit and the unfit. They suggest in very truth that all intelligent and respectable parents should take as their example in this grave matter of child-bearing the most irresponsible elements in the community.

Eugenic proposals, unfortunately, have indeed been largely of this character. They lack substance, thoroughness, and practicability. Their short-sightedness comes from neglecting the very intimate relationship between population saturation and the individual struggle for existence. Their impracticability lies in asking the thinking person to do what his intelligence tells him is a bad thing for himself and his posterity. But eugenic policies can be broad, and they can be practical. Populations can be limited to a point where each person has a reasonable chance not only for pursuing but for overtaking happiness. And by properly planning this restrictive breeding the average capacity of every commonwealth can be raised without a ridiculous competition for large families between the superior and the inferior, and without diminishing our charitable care for those who need it.

There is no question of the reckless fertility of the irresponsible. Studies have now been completed both in this country and in Europe on so many degenerate families that the matter is settled. No social worker is unacquainted with the dreary histories of the Jukes, the Kallikaks, the Nams, the Zeroes, the Hill Folk. They marry young and frequently, and they reproduce their kind in like quality whether married or unmarried. Several investigations have shown that the fertility exhibited by these strains is more than twice as great as in the general population. Even in the American families, where the records are incomplete, the number of children actually traced is unbelievably high. Among 403 married Juke women, 330 were fertile and 73 sterile, and the 330 fertile women averaged 4.3 children each; among 120 reproducing Nam women, the average number of children discovered was somewhat over 4.

The only thing keeping such ne'er-do-wells from increasing their proportion more rapidly than they do is the high death-rate which is the result of their own incapacity; and one of the most pitiable features of our present system of charity is its tendency to remove this natural means of retaining the social equilibrium. Says Spencer: "Fostering the good-for-nothing at the expense of the good is an extreme cruelty. It is a deliberate storing up of miseries for future generations. There is no greater curse to posterity than that of bequeathing them an increasing population of imbeciles." Yet this is our policy.

The world will not be peopled ultimately by imbeciles, even with a continuation of the current system. One may rest assured that these people cannot increase their proportion beyond a certain unknown maximum, because gradually the surplus goods produced by the active efficient workers and used to support the drones must shrink. Parasites must have hosts, or they perish. Nevertheless, the existent type of charity is certainly dysgenic; it is promoting an unprecedented increase in people who, for their own good as well as for the good of others, should never have been born. This is pure stupidity, not the attainment of a humane ideal. The most amiable benevolence demands nothing more than the kindly treatment of the individual. Let us admit this at once, and do something toward decreasing the numbers of the unfit in the future, either by a thoroughgoing scheme of segregation or by sterilization, if that should prove to be wise. It is shameful to the rational man to feel that the fate of his descendants is determined largely by the social policy in vogue to-day, and to find that policy shaped by folly in the guise of disinterested generosity.

I would not dwell further on this theme. It has been expounded *in extenso* many times before. And important as it is, it lacks something of the interest attaching to policies which relate to those who are not inherently feeble-minded or otherwise abnormal.

Among those who are not defectives there is an immense range of variation in hereditary capacity. This is true within every nation whether that nation is comparatively pure ethnically or is the final result of the intercrossing of many stocks. Nations may show different levels of capacity; but, as has been emphasized earlier, this difference is relatively small as compared with what is found among the individuals making up those nations. This variability is proved by records of accomplishment in narrow family groups and in broad family groups. It is proved by intelligence tests and by capacity to assimilate knowledge. Historical records, biological investigation, and statistical research combine to establish the fact. And by whatever methods one distinguishes those whose inherited abilities make them in some measure the more desirable members of society, it is found that they are continuously outbred by their less well-endowed fellow citizens.

A generation ago Bertillon[1] studied the marriage-rate, the age at marriage, and the birth-rate of the citizens of Vienna, Paris, and Berlin grouped according to their economic success in life from the very poor to the very rich. The defectiveness of such classification as an indication of social fitness is well recognized, but granting its roughness and injustice in individual cases, it is not without its value in estimating the social worth of the individuals concerned. The results are striking. The greater the economic failure in life, the lower was the age at marriage and the higher was the marriage-rate and birth-rate. For example, the marriage-rate per thousand men over 20 and women over 15 was 20.5 in the very rich districts of Berlin, and rose by definite steps to 44 among the very poor, while the annual birth-rates per thousand women of reproductive age in the same quarters were 71 and 200 respectively. Similar records galore have been compiled for numerous other localities both in Europe and in this country.

If one bases his judgment on educational standards he finds identical conditions. Miss Murphy[2] found that the women graduates of Washington Seminary between the years 1845 and 1900 showed decreasing inclination to marry and to replace themselves. This is no less true of Wellesley,

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[1] Bertillon, J., *La Dépopulation de la France, etc.* Paris; Alcan, 1911. See also *Bull. Inst. Internat. Stat.*, 11: 163–176, 1899.

[2] See Popenoe and Johnson, *op. cit.*

Bryn Mawr, Smith, or any other of the institutions catering to the higher education of women. Less markedly it is true of coeducational seats of learning. Holmes[1] recapitulates the situation in this way:

> It may be said that about 50 per cent of college women remain unmarried. It is apparently true that women of superior intellect and force of character are those who, whether college women or not, are pretty apt to be selected for spinsterhood. They are more likely to win positions which permit them to enjoy the comforts and many of the luxuries of life; they develop other interests which often detract from the appeal to matrimony. In some cases they lose a certain feminine charm, a misfortune that arouses a deep-seated instinctive recoil in the opposite sex. There can be no doubt that the race is losing a vast wealth of material for motherhood of the best and most efficient type. Many of the women who are nowadays most prone to sacrifice motherhood to a "career" are just the ones upon whom the obligation of motherhood should rest with the greatest weight. It may be seriously doubted if the growing independence of women, despite its many advantages, has proven an unmixed blessing. Thus far it has worked to deteriorate the race in the interests of social advancement, a process which is bound to be disastrous in the long run.

In general the marriage-rate of college men is greater than of college women, but even here the marriage-rate, the age at marriage, and the birth-rate in their families all make for the disappearance of the group. This is established by Phillips's[2] studies of the class lists of Harvard and Yale, by Popenoe's[3] investigation of the conditions at Stanford, by Banker's[4] compilation of the records at Syracuse, and by several other studies.

One finds the situation similar when social value is based on the general success in life which causes a person to be recorded in such books as *Who's Who in America* or the English *Dictionary of National Biography*. Thus in every case the records show that the worthiest members of society are not replacing themselves. The increase in population is being taken care of by those with the least genetic fitness. Karl Pearson finds that 25 per cent of the people of one generation give rise to 50 per cent of the people of the next, and in general the prolific quarter is the least desirable quarter. As Mercier says, society is like a candle which burns out at the top and replaces itself from the bottom.

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[1] *The Trend of the Race*, p. 232.

[2] Phillips, J. C., "A Study of the Birth-Rate in Harvard and Yale Graduates," *Harvard Grad. Mag.*, September, 1916.

[3] Popenoe, P., "Stanford's Marriage-Rate," *Journ. Her.*, 8: 170–173, 1917.

[4] Banker, H. G., "Coeducation and Eugenics," *Journ. Her.*, 8: 208–214, 1917.

If civilization is worth anything, this is a bad situation. There is no mercy in Nature. She has no power to forgive the infraction of her laws. If, therefore, man sees fit to practise methods of propagation he has discarded for his cattle, then he will deteriorate. He need not expect miracles to be performed for his benefit.

But before discussing the constructive aspects of this problem, it is perhaps worth while to bring out a neglected point connected with heredity which to the optimist may be a ray of hope shining through all this haze of gloom. If the brief account of the heredity mechanism given earlier is recalled, it will be remembered that the inherent qualities of every individual are produced by the interaction of numerous separately transmissible units. The heredity of the superior man is not altogether desirable, nor that of the inferior man wholly objectionable. The one inherits some elements making for mediocrity or worse, the other has a humble share of potential genius swamped by bad company. These are facts to be reckoned with in social affairs. They tell us that the mating of two inferiors is deplorable because the odds are overwhelmingly in favor of the production of more inferiors; they tell us that the mating of two superiors is desirable because of the probable production of worthy children; but they also tell us that just as the incompetent portion of society can never be weeded out completely by preventing the reproduction of defectives, so also it is impossible to eliminate intelligence by underbreeding among the sagacious. Thus, however desirable it may be to prevent the spread of notoriously defective germ-plasm or to encourage the diffusion of the superexcellent—and neither lacks importance—it must be remembered that in the solid ranks of the common people there is a mixture of qualities which will always serve to swell both streams.

Either because they have failed to grasp the complete significance of these genetic principles, or because they have closed their eyes to their logical consequences, the eugenists have seldom gone farther than to make the pathetic suggestion that the whole current of society can be changed by interfering with the two little rills which flow from either side. Society has two duties, they say; those obviously defective should be prevented from having families, those with outstanding merits should make up the deficit no matter what the cost to themselves. The scheme is unobjectionable, theoretically, as far as it goes; but it does not go far enough, and it is not feasible. The really useful eugenics is properly directed birth-control, and the only practical directive agent is education. One may say this dogmatically. The reasons why this must be so are few in number and not hard to outline. They are fasces bound up inextricably with the two fundamental instincts and with heredity.

If world saturation of population, which approaches speedily, is not prevented, in its train will come more wars, more famine, more disease. With the struggle for existence made more acute by such a condition, the possibility of helpful co-operation among mankind disappears. He is compelled by circumstances to give rein to his instinct for self-preservation. He can do no less. It is no cogent argument against these statements to say that war, famine, and disease have always afflicted mankind. This is a simple truth. There will be misery in the future as there has been in the past. But the *sine qua non* for preventing *increased* misery is a restricted population. Then and then only can the other remedies for distress be applied effectively. With an unsaturated population every man *can* be given the freedom to achieve that of which he is capable, general hygiene *can* be promoted, and equitable distribution facilitated. These are the three lines of progress desired by honest and sensible socialists, and not opposed by honest and sensible conservatives. They are the honorable objectives toward which civilization has been creeping. But it is the height of folly to suppose that these reforms, which depend upon the quasi-altruism manifested in group co-operation, can ever make headway when the individual struggle for existence brings demands that crush both body and spirit.

The first requisite for the convalescence of the sick old world, therefore, is restricted population. With it mankind may show a progressive evolution of body, mind, and soul; without it the door is shut. It is most extraordinary that there is not a wider recognition of this fact in an era when the fruits of so many millions of discoveries and inventions are being enjoyed. Here is man, delving deeply into Nature's secrets on every hand, making himself the master by dominating his environment. The measure of his progress is the freedom he has achieved to steer where he will, unrestricted in his course; yet he makes no effort to avoid those jagged rocks charted by Malthus, where shipwreck of his bark is certain. As William Hawley Smith[1] puts the matter so forcibly, all man's accomplishments are to be measured by the degree of his emancipation from uncontrolled chance which so long held him in thrall. "Will chance ever be cast out from the highest function of human beings," he says, "or must souls forever be incarnated haphazard?"

There are, of course, several ways of eliminating excess population at man's disposal. He has been experimenting with murder in the form of war, infanticide, and abortion from time immemorial; and he will not abandon these methods if overpopulation evils continue. There is little need of discoursing on these primitive solutions of the problem. They are unmoral and they are wasteful. The dysgenic effects of war in killing off the finest specimens of young manhood, and the economic distress thrust upon those who are left, are but too apparent; the economic waste of infanticide and abortion is similar to that of war, though there is perhaps no such eugenic loss. But what mankind needs is not methods of doing away with superfluous people, rather it requires a means of preventing such superabundance; and happily the twentieth century has at its disposal methods of birth-control unobjectionable either from the standpoint of ethics or of physiology. There is no need of recourse even to the makeshift recommended by the author of the *Essay on Population.*

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[1] Smith, W. H., *Children by Chance or by Choice.* Boston: Badger, 1920.

Unfortunately there is still a goodly percentage of the population who look upon delayed marriage and increased celibacy as a more desirable overpopulation remedy than the prevention of conception. Those who maintain this attitude are ignorant both of evolutionary biology and of modern medicine. The sexual instinct is much too deep-seated to give much hope of preventing overpopulation by such means. It seems strange that such a keen thinker as Malthus did not realize the fact. Moreover, the sexual repression scheme of preventing population pressure has counts against it other than the mere negative one that it is lame and ineffectual. It is more than inexpedient, it is actually deleterious. The Christian world has been bound by a man-made tradition which assumed that the possession of the sex instinct was something of which to be ashamed. This odd theological dogma has been so well rooted that until recently ordinary academic discussion of sexual matters was not permissible in the polite society of Europe and America. Even to-day medical discoveries relating to sex are practically unknown to most people, and are discounted by many who are acquainted with them merely because of their slavery to tradition. Nevertheless, the facts are that physiologists and neurologists working hand in hand have demonstrated that in the evolution of the sexual means of reproduction Nature found it wise to work into the sexual sphere numerous matters which have little to do with the mere perpetuation of the species. The words man and woman mean much more than convenient designations for the bearers of two kinds of sex-cells. The sex differences carry with them profound differences which run the whole gamut of physiology and anatomy. Man may not be superior to woman, nor woman superior to man; but they are different, different throughout, physically and psychologically. The sex organs function in the production of secretions other than those which go to produce the next generation. Their duties are manifold. So also is the sex relation complex and many-sided. It fulfils physiological requirements unconnected with procreation. Those who would inform themselves more thoroughly on the matter should read the pamphlet which set all England by the ears, written by the eminent physician, Lord Dawson.[1] It is sufficient for our purpose here to say that in the opinion of psychiatrists too stern a repression of the sex instinct is at the bottom of the great majority of the cases of neuropathology which are not hereditary. There, in a single sentence, one has a complete indictment of the original Malthusian remedy for the evils of overpopulation. It is in the nature of the old human-sacrifice cure, with the sacrifice more long drawn out.

Innocuous methods of limiting the family, says Havelock Ellis,[2] are the greatest discoveries of the twentieth century. He is not far wrong, if one believes, with Huxley, that overpopulation is the greatest obstacle to human progress. And certain methods are innocuous, there is no doubt, despite the claims of a few ignorant and superstitious persons. Belief in their mischief-making belongs in the same class as belief in the evils attending the opening of windows in the sleeping-room or the taking of baths in the wintertime, which unfortunately are still wide-spread.

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[1] *Married Love.*

[2] Ellis, Havelock, *The Task of Social Hygiene.* Boston: Houghton, Mifflin, 1913.

To summarize, then, social progress requires better breeding in the first instance, in order to raise the racial potentiality for accomplishment; it requires a voluntarily standardized population in the second instance, in order to retain an environment in which these potentialities can be realized. The present trend is away from both of these ideals because too high a natural increase of population is still maintained, and because the contributions which occasion this increase come disproportionately from the least desirable elements. The remedy proposed is to promote birth-control at the lower end of the social scale. There remains to point out somewhat more concretely the needs and the possibilities of this remedy.

We shall examine the situation as it exists in the United States. Other countries might be used to replace it as bad examples. There are data for England and Wales, Scotland, France, Germany, Italy, and Australia and New Zealand which show them to be on the downward grade eugenically through the high fertility of their inferiors and the low fertility of their superiors; but these data were obtained from studies of the population divided on the basis of economic success, of education, or of accomplishment, and though the correlation is high enough to make such groupings fairly accurate measures of eugenic worth, they lack something of the precision of the intelligence tests available for the United States. Then again, each of these countries has the inestimable advantage of being fairly pure ethnically itself, and of being able to ship the worst of its production to the United States for happy acceptance there.

The United States holds the unique position of a country growing from an unexploited wilderness into a nation so nearly approaching the saturation point in terms of population as to experience decreasing returns in agriculture, in a little over a century of existence. Earlier, the emigrants were almost wholly of Nordic stock; more recently the new arrivals have been coming largely from the non-Nordic peoples of eastern Europe. In the first half of the national history the people entering the gates were good average samples of the stocks to which they belonged; in the second half they came in greater and greater numbers from the submerged portion of their own ethnical group. There has been a great difference of opinion as to what this sort of amalgamation will mean in the future. We have been pleased to call our country the Melting-Pot. There has been a general belief that the Pot itself had a kind of mystical virtue, that it was built of the substance of the philosopher's stone and turned its contents to pure gold. But such fairy-tales are suited only to childhood, and this nation has passed its childhood. Heredity does not work this way. If dross is poured in, dross it remains. It can be eliminated only by cutting it off biologically, by preventing its perpetuation—if a rather mixed metaphor will be permitted. The pure gold also can be retained and increased only in the same way. And as matters are going, it stands a very fine chance of disappearing instead of increasing.

A few of the gross facts will suffice to give us a picture of the situation. Recall that the country is still increasing at a rate of about 11 per thousand annually in spite of the general drop in the birth-rate. Where in 1820 there were 928 children under 5 per thousand married women of reproductive age, in 1920 there were only 467; but about half of this drop has been ineffective in reducing the natural increase of population because of the diminishing death-rate. The United States is thus increasing fast enough for the present, even without immigration, and too fast for the future. The question we are asking is: From whom does the increase come?

If one makes a study of the fertility of foreign and of native stocks in *limited* areas, the conclusion is that recent immigrants are producing the greater part of the Americans of the future. Several studies made between 1900 and 1909 in Massachusetts, New Hampshire, and Rhode Island showed that nearly twice as many native married women as foreign married women were childless, and that roughly the fertility of the foreign-born woman was double that of the native-born. The effective fertility, that is to say the fertility corrected for the differential death-rate, was about 50 per cent in favor of the foreign born. The contrast was even greater in our huge metropolis. Duncan and Duke[1] found that in New York City in 1914 a foreign population of two-fifths produced two-thirds of the babies. Other investigations of birth-rates in great cities uncover similar conditions, though the discrepancy is not so striking. Hoffmann,[2] from a study of genealogies, comes to the conclusion that in American families the number of children per wife has steadily dropped from about 7 in 1700 to 2.25 in 1900. Doud[3] finds a similar relative drop and greater actual drop in the families of the *Mayflower* descendants. Others have studied various high-grade colonial stocks with similar results.

There is some truth and some fallacy in these reports. Undoubtedly the number of children per thousand married women has declined in all of the older American stocks. Such a change is inevitable under the shifting economic conditions of a growing country. Up to a certain point this decline is a good thing for the mother and for her children; both have better chances to survive and do effective work. The survival rate is shifted upward, and the smaller size of the family does not necessarily mean a decline in natural increase. If one may take it as a fact that American families averaged about 7 children in colonial days and now average about 2.6 children, however, it is stupid to assume that there has been a similar proportionate drop in natural growth. The real drop in the increase per thousand of the population has been from about 16 to somewhat less than 11. Similarly, the belief in the disappearance of *Mayflower* descendants and of the old Virginia stocks is largely fallacious because the descent has been traced chiefly through male lines. The truth is that any stock traced through the male line is likely to show diminishing returns. A third fallacy lies in placing too much dependence on statistics gathered in particular localities and among selected groups of people. A fourth absurdity is that of assuming a continuance of the high fertility of the foreign women with the next generation. For example, Eastman[1] finds that the births to white mothers, per thousand of the population, in New York State exclusive of New York City in 1916 was: native, 17.2; foreign, 43.8; English, Scotch, and Welsh, 19.1; Italian, 91.6; Russian, 88.6; Austro-Hungarian, 89.9. There is here an extraordinary contrast between native and foreign-born women and between Nordic and non-Nordic women. Naturally a good deal of the difference in fertility between races as such will persist; but at the same time one ought to realize that the daughters of these foreign women are native women, and that their birth-rate drops tremendously.

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[1] See Holmes, S. J., *op. cit.*

[2] Hoffmann, F. L., "The Decline in the Birth-Rate," *North Amer. Rev.*, 189 : 675–687, 1909. *The Significance of a Declining Birth-Rate.* Newark: Prud. Press, 1914.

[3] Holmes, S. J., and Doud, C. M., "The Approaching Extinction of the *Mayflower* Descendants," *Journ. Her.*, 8 : 297–300, 1918.

Thompson's[2] study of Race Suicide in the United States covers these points more adequately than most of the papers we have just cited. His inquiry embraced the entire United States in the year 1910, and I have extended it by examining the returns of the Census Bureau for 1920. In 1910 the white population of the United States was 81,731,957; and of this total, 42,352,663 lived in rural districts. The country was thus still predominantly agricultural. Even at this time there were more women of child-bearing age, 15 to 44 inclusive, in the cities than in the country, however; there being 10,382,634 women of this age group in the urban districts and only 8,877,985 in the rural districts. Nevertheless, the smaller group of women from the rural communities had 5,355,957 children under 5 years of age, as compared with 3,966,957 children under 5 for their urban sisters. Thus there were 382 children under 5 for every thousand women of child-bearing age in the urban districts, and 603 children of similar age for every thousand women of this group in the rural districts. This is a fact full of significance, for over three-fourths of the rural white population was native born of native parents, while only about four-ninths of the urban white population belonged to this class. Furthermore, between 80 and 90 per cent of the rural population was of Nordic stock, while only some 60 per cent of the urban population belonged to this strain.

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[1] Eastman, P. R., "A Comparison of the Birth-Rates of Native and of Foreign Born White Women in the State of New York During 1916," *Bull. N. Y. State Dept. Health, p.* 15.

[2] Thompson, W. S., "Race Suicide in the United States," *Amer. Journ. Phys. Anthropology,* 3 : 97–146, 1920.

Ten years later, in the census of 1920, the same general situation held. The white population had grown to 94,820,915, of which 13,712,754 were foreign born, the percentage of foreign-born white to total white population having dropped from 19.3 to 14.5. The percentage of the urban population, on the contrary, had gone up; there were now 50,620,084 people, or 53.4 per cent, in urban districts, and only 44,200,831 people, or 46.6 per cent, in rural districts. The immigrants had continued to feed the cities, and many of the country boys and girls had disappeared into the same hungry maws. The Nordic stock of the rural communities, nevertheless, was still holding its own; the 12,756,691 urban white women of the age group 15 to 44 years had only 4,995,277 children under 5 years, while the 9,260,910 rural white women of this class had 5,378,644 children under 5 years of age. The disproportion was not so great as it had been ten years before, however; for the relative number of children among the urban women had risen from 382 to 392 per thousand, and the relative number among the rural women had dropped from 603 to 581 per thousand.

There is food for thought in these statistics. For the first hundred years the white immigration to the United States was almost wholly Nordic—British, Scandinavian, and Teutonic. More recently, that is to say, until the more stringent immigration laws came into effect, the Nordic immigration was being replaced by people from southern and eastern Europe. Where a generation ago the total immigration from western European countries was over 70 per cent and the total immigration from southeastern and eastern Europe was less than 20 per cent, in 1914 the new arrivals from northern and western Europe were only 18 per cent and those from southeastern and eastern Europe amounted to over 75 per cent. In other words, the country, built up by people of a fairly uniform ethnical group with similar ideas and ideals, had become a loadstone to people belonging to other ethnical groups having different ideas and ideals. But, contrary to newspaper reports and magazine articles by excitable persons, the tide of new arrivals has not yet really begun to swamp the older inhabitants. The United States is still predominantly Nordic, and in all probability will remain so. The catastrophic waves of immigration which threatened to swamp the country a decade ago have been controlled, and will be kept under control. The duties of the present citizenship are to see that the surrounding dikes are properly tended and that all goes well within. This is not going to be an easy task. There are various organizations continually tearing at the barrier which prevents the onslaught of the aliens from without; and, as the difference between the statistics for 1920 and for 1910 shows, the Nordic home-guard is weakening. The sterilizing effect of the city on the fertile newcomer will not alone prevent a genetic change in the race as time goes on. It must be aided by a reduction in the effective fertility of these stocks as a eugenic measure as well as for a preventive of overpopulation.

I am not a race dogmatizer, as those who have followed me thus far must have perceived; but I think there are good reasons for putting up the immigration bars still higher in the United States, and for directing efforts chiefly against the increase of southeastern and eastern European stocks either through migration or through the natural excess of births over deaths. The true eugenic task in this country is to depress the birth-rate of the social weaklings wherever found; but there are some real data tending to show that the greatest percentage of unfitness actually is found in just these groups.

Let there be no mistake as to the actual position taken in this regard. No student of heredity can help being impressed with the fact that inherent differences between individuals within a given ethnical stock are very much greater than average differences between stocks. Hence there is no great good to be gained by maintaining that the Nordic social-fitness level is higher than that of some other group. The spread between the individuals within a given group is relatively enormous when compared with the spread between racial averages of white-race groups. For example, suppose one could measure accurately the intelligence levels of Englishmen, of Italians, of Hebrews, and of Slavs. He might find certain differences in the averages, but the distributions would be coextensive over the greater part of the range. On the other hand, there are actual historical and psychological data which show that in the United States racial levels are sufficiently different to make it a matter of some moment. Confining ourselves to a consideration of the white race, one finds that the studies of Cattell, of Woods, and of several others as to the relative contribution of great men by the different races entering into the ethnical make-up of the population show an extraordinary balance in favor of the Nordic in proportion to their actual percentage in the population with perhaps the Hebrews in second place. There is no need to enter into the relative placement of the subgroups. I only wish to point out that one might assume an equal distribution of intelligence in the homelands of each of these peoples, and still expect to get just this result here. The crucial point in the whole matter seems to be that in the early history of the United States the immigrants came from the *best* stocks their countries afforded; in recent times they have come from the *lower* part of the distribution. This is true even of the Hebrews, who, contrary to general belief, are probably the most variable race on earth. The early immigrants were English and German Jews, who furnished a high percentage of greatness to our country; the recent Hebrew immigrants are largely from eastern Europe, and while they undoubtedly are producing many estimable citizens, the frequency with which they attain note has dropped markedly.

The intelligence tests of our psychologists bring out these facts in a concrete manner. From the report on the examination given to the army recruits, one finds a remarkable difference in the ratings obtained by different nationalities. Young[1] has tabulated them as follows:

Nationality	Per cent rating A and B	Per cent rating D, D −, and E
Total white draft	12.1	24.1
All foreign countries	4.0	45.6
England	19.7	8.7
Germany	8.3	15.0
Sweden	4.3	19.4
Austria	3.4	37.5
Ireland	4.1	39.4
Russia	2.7	60.4
Italy	.8	63.4
Poland	.5	69.9

As Young says, "the superiority of the Nordic stocks over the others is evident in this table." And they obtained their superior ratings, not by means of language advantages but because they were actually more intelligent, for the men who were unable to handle the verbal tests were given other types of tests.

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[1] Young, K., "Intelligence Tests of Certain Immigrant Groups," *Sci. Mon.*, 15: 417–434, 1922.

Young also quotes some unpublished work of Dickson, who undertook some intelligence tests on children of different racial groups in California public schools. The number of cases in each group was rather small but the extreme differences in the Median Intelligence Quotients were such as permit no other conclusion than that some groups were much more intelligent than others.

INTELLIGENCE QUOTIENTS IN FIRST-GRADE PUPILS BY RACIAL STOCK

After Dickson

Race	No. cases	Median I. Q.
Spanish	37	78
Portuguese	23	84
Italian (chiefly southern Italy)	25	84
North European born	14	105
American (north European stock)	49	106

Those who object to drawing the natural inference from these results base their objection on the assumption that these tests merely show the result of environmental differences which would be eliminated by proper training. Young asks these critics a very pertinent question in this regard. He inquires of the environmentalist how he accounts for the fact that children who started in school at the same time are at 12 years of age distributed from the third to the eighth grade. But this is merely in passing. Miss Thomson undertook to investigate the question quantitatively by retesting the same children tested by Dickson after a lapse of five years. Her results, given in the following table, show that education has not had the effect predicted by the euthenists; racial differences stand out as markedly as before. They are a striking enforcement of the claim that these tests are relatively unaffected by schooling.

CHANGE IN MEDIAN INTELLIGENCE QUOTIENT AFTER FIVE YEARS FOR VARIOUS RACIAL GROUPS

After Thomson

Race	1916 Med. I. Q.	1920 Med. I. Q.
Total south European......	88.0	85.5
Portuguese...............	88.3	74.0
Americans (from one school)	111.0	110.5
Americans (another school).	102.3	95.0

Other tests have yielded comparable results. One of the most interesting was made by Miss Murdoch[1] on Hebrew, Italian, "American," and negro children from neighborhoods as nearly alike as was possible. The test was devised by Pressey along the lines of the army alpha test and was given to about 500 boys in each of the white groups and to 225 negro boys. The result was that the Hebrew and the American boys ran neck and neck and were far superior to the Italians and negroes, who were also not far apart.

Without going further into the question of average differences in racial intelligence as measured by such methods, it is safe to say they are marked enough to make the thinking man an immigration exclusionist as regards southern and eastern Europe, despite clamors against discrimination. If these countries wish to breed rapidly from their worst, that is perhaps their own affair. But it becomes an affair of this country if they wish it to be a haven for their "rejects." Unfortunately, so many do not think, and still more unfortunately a percentage of those who do think give the impression of caring not a rouble whether their country becomes peopled with near-morons or not. Their mean, sordid, little souls are taken up with the problem of obtaining cheap labor. As I have said before, cheap labor is really dear labor from the standpoint of industrial efficiency as well as from the standpoint of national stamina; and the capitalist who seeks it will be the loser. At the same time I am sorry to say that I must cater to his self-satisfaction by informing him that there will always be a greater dearth of high-grade labor than of low-grade labor. We do not have to import it; we breed it, enough and more. It is this truth of which I now wish to speak. The question of immigration may be left, I think, to the union laborer and the farmer. They have had their eyes opened to the results of competition from alien toilers with low standards of living.

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[1] Murdoch, K., "A Study of Race Differences in New York City," *School and Soc.*, 11: 147–150, 1920.

A few figures will give an idea of the number of defectives needing institutional care in the United States. In 1910 there were 84,198 paupers enumerated in almshouses, and, oddly enough, there were a great many more males than females. A huge proportion was foreign born. People of alien birth formed 16 per cent of the population in that year, but they made up nearly 43 per cent of the inmates of these institutions. There were 136,472 prisoners and juvenile delinquents in penal institutions at the beginning of the year, and 493,934 commitments during the year 1910. No one knows how great a proportion of these non-social individuals were such because of their heredity, but the records of the army on their own law-breakers indicate that it is high. Again, the foreign born lead with 1.57 per thousand as compared with .88 per thousand native born. The census of deaf and dumb, where heredity plays a great rôle, was 44,708. The number of blind was 57,272, with probably only a small percentage congenital. The total number of insane, enumerated at the beginning of 1910 and admitted during the year, was 248,560. There were 1.69 per thousand natives and 4.05 per thousand foreigners. The increase beyond that expected from the growth of population has been notable for many years, though it is not any greater than is found in most foreign countries. Better provision for institutional care and advances in diagnostic methods undoubtedly account for much of this increase; at the same time most psychiatrists are united in believing that insanity is increasing. Probably somewhere near half of it shows traces of hereditary influence. Low-grade, feeble-minded persons in institutions totalled only 20,731, but the census is not regarded as complete. Competent authorities estimate that the number of low-grade feeble-minded is not less than 300,000, and the percentage of rejections from the army on these grounds indicate that 500,000 is not too high an estimate. Probably 80 per cent of the cases is due to heredity. The natives lead the foreign born, but this is undoubtedly due to rejection at the ports of entry.

These figures are appalling. Between a million and a half and two million people in the United States are defectives needing institutional care. At least half of them owe their defects to inheritance and will in time produce their kind in high degree; but only a comparatively small fraction are restrained in any way, and only a still smaller fraction are prevented from propagating either by segregation of the sexes or by sterilization. Even those who are committed to institutions for a time are generally discharged after short periods, and are permitted to do their best toward lowering the national efficiency by increasing the number of defectives of the next generation. The need of eugenical methods to help stem this tide is unquestionable; nevertheless, it is not merely by cutting off the dysgenic influence of this group that a better race will come. It is by decreasing the proportion of the so-called normals who appear in huge numbers just above the institutional line and who reproduce at least twice as rapidly as those at the other end of the scale of intelligence.

Those who suppose that all Americans, or at least all American Caucasians, are white-collar men who cannot be employed in capacities other than as directors and leaders of men would also do well to examine the frequency of illiteracy. Adults who can do no more with letters than to write their names, and who usually cannot do even this, are hardly fitted for positions of responsibility; yet there were 4,931,905 enumerated in the census of 1920, and 3,089,744 were of the white race. This proportion of 60 persons per thousand over 10 years of age unable to write a few simple words is hardly a desirable showing for a country supposedly advanced in civilization. It is about 30 times as high as in Germany and Scandinavia, and considerably greater than in England, Scotland, Holland, France, and Switzerland. But even this proportion does not represent the facts. Of the 1,566,011 recruits examined by our psychologists in 1917 and 1918, 25.3 per cent were unable "to read and understand newspapers and write letters home." Unable to take the alpha examination which any good third or fourth grade pupil ought to manipulate easily, they were given the beta examination for illiterates. If this relationship holds in the general population where in 1920 there were nearly 83 million people aged 10 years and over —and there is absolutely no reason for assuming that it does not hold—then there are over 20 million people in the country who are fitted for nothing above the position of common laborers. These are people who are poor because they are unintelligent as well as "poor because they are ignorant." In great proportion they could never rise far beyond their present condition because of their heredity; yet if there is one thing more than another which stands out as a means of alleviating the personal hardships of the situation it is sympathetic advice and direction on the subject of birth-control, for they are the people with the high birth-rates. Yet our capitalists say they must import cheap labor!

It is quite possible, of course, that some of this illiteracy is due to lack of opportunity. Equal opportunity for all is somewhat of a fiction with us despite our worship of the saying. It is worth our while, therefore, to turn again to the results of the army examinations. One finds there that of 1,726,966 men examined, 46,347 were mentally under 10 years of age, to use the terms current in psychological nomenclature. They were in fact feeble-minded, though most of them were not proper institutional cases. The mental-age designation is somewhat inaccurate and meaningless, therefore one need not hold to it. The fact of more importance is that these men were so stupid that it was not even worth the while of the government to outfit them and to try to train them for military service. They could not make of them the ordinary type of common soldier who certainly does not need to be extremely intelligent to perform his regular duties. The army examinations of recruits inducted into the service, then, resulted in finding that 2.77 per cent were high-grade feeble-minded. In addition it is supposed that twice this percentage were rejected by the physicians making the original examination of the drafted men. Let us be conservative, however, and place the total number at 5 per cent.

The conclusion is that in the United States there are between 5 million and 6 million people who are often mentally above those who properly can be committed to institutions yet who lack sufficient intelligence to go through the primary grades of our public schools. In addition, the same method of calculation shows about 20 millions whose intellects will not carry them through the grammar school even with hard driving. People with no sense worthy the name, defective stock, over 5 millions; people with little sense, scrub stock, 20 millions. These are the people who multiply at from one and a half to twice the rate of the superior classes of our population. And we expect to restore the balance by expecting the latter to compete with them in the size of their families.

No! Eugenics is sorely needed; social progress without it is unthinkable; but the eugenics which merely prevents the procreation of those who are so defective as to be confined in institutions, and which asks the most intelligent of the remainder to make up the difference, is nonsense. What the country needs is to follow the example of Holland and to teach birth-control methods as a matter of public policy. This stolid portion of humanity which we have just described is efficient only in the matter of reproduction; but for the most part they are not stupid enough—at least the women are not—to wish to go on contributing to the unhappiness of their lot by bringing a baby into the world every year. One does not need the intelligence implied by the capacity to finish a grammar-school education to appreciate this fact, if it is presented properly by public health officials. Such people will grasp avidly at the opportunity to be relieved of some of the stress of economic competition. Left alone they will go far toward bringing the country to a state of decadence, and if they are left alone the country deserves its fate; but if the nation awakes to the consequences of the present policy, there is hope both that their present lot will be alleviated and that the task of the future will be less heavy.

CHAPTER XI

THE WELFARE OF THE FAMILY

A LIVELY interest invariably attaches to specific questions of family welfare. Matters which concern the individual or the family intimately as human beings with the infinite capacity of human beings for joy and sorrow have an imperious appeal to the emotions; the same matters treated through the study of a host of individuals as abstract entities leave one cold and indifferent. This acute susceptibility to sentiment presents an opportunity to the charlatan and the hypersensitive enthusiast which is seldom overlooked; hence the serious student is inclined to overlook descriptive information entirely. But there is no excuse for avoiding useful data merely because they are of the type to arouse the emotional equation of sympathetic persons. The fortunes of the nation or of the race are, after all, the sum total of the fortunes of the family, for the family is the unit of civilization; and the welfare of these units can be discussed sanely and objectively. If it is not so discussed, the trouble lies with the analyst and not with the facts. What one should regret is the meagreness of accurate evidence concerning the family as a social unit, rather than to mark it down as valueless because it is gathered by the case system. If more data of this character were collected by trained investigators, fundamental conclusions could be drawn regarding a great many social issues which are now construed only by conjecture and imagination. As matters stand, one can claim rigorous precision in relatively few of such inquiries. He is limited to pointing out in general terms the apparent trend of the facts.

A few years ago I should have said one might take as an axiom from which to start this consideration the belief that the human race can have no nobler aim than to place woman securely in a position where she may be such mistress of her fate as to bring into the world only such children *as* she chooses *when* she chooses, holding that the exercise of judicious discretion in this regard, with the opportunity it offers for planning and preparation, must work for the common good. If there is not full freedom, it seems as if both mother and child are being defrauded of a reasonable chance for life and health, hindered in their liberty of action, and restrained from the pursuit of happiness. I now realize what an unsophisticated person a biologist can be who puts his trust in rational formulas and natural laws instead of the dogmas of old folkways. One sees communications from doctors, lawyers, and captains of industry who most assuredly do not accept such a statement as axiomatic. In fact, the idea strikes them as carrying within it a terrible menace to society in some mysterious way. They fear for the consequences if women are permitted to depart from the ways of their jungle ancestors, and to bring forth children by choice as thinking beings. To him who carries this feeling as a relic of the timidity which led man to fear to allow women to read, to hold property, to vote, or otherwise to assume a full partnership in life, one may say with Solomon: "The foolishness of fools is folly." If it be a case of anxiety about the disappearance of the human race, one must exercise indulgence, and recommend a course in elementary biology. If by chance the solicitous one should be a physician, there is a pertinent reply in a statement found in *The Vote*[1] of September 24, 1910, commenting on a discussion of medicine as a profession in *The British Medical Journal.* In effect it runs somewhat as follows: The medical article says the decline of medicine as a profession is due to the lower birth-rate, which has had the dual effect of presenting fewer confinements and fewer babies to attend. "We are quite willing to admit this, and, further, to admit the bearing of this factor on the doctor's income; but we are not willing to admit that this gives the doctor any right to preach the doctrine of large families. We go further, and say that it does not justify the medical profession in encouraging the coming of unfit children into the world, and in failing to warn women unfit for motherhood." If the conscientious objector should be one of those fearsome persons who admits that poverty and sickness might thereby be alleviated and happiness promoted, but who trembles for the *morality* of the community should such things be, his attention should be called to the recent psychiatrical conclusion that such fulminations are often the result of one's own repressed desires. If, finally, the argument should be carried forward by one of those celibates who on physiological, economic, or religious grounds exhorts others to shoulder the burden they themselves have shirked, one can only take refuge in the dignity of silence.

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[1] See *The Small Family System*, by C. V. Drysdale. N. Y.: Huebsch, 1917, p. 19.

It is strange that in the matter of this important function the human race should have remained so largely the prey of fate. Even in Holland, where birth-control instruction is made a matter of public health and where 50 clinics are kept in operation, I am told that lack of knowledge concerning the fundamentals of reproductive physiology is still extraordinary. In England, where there are no strictly enforced laws on the subject, there is a much greater degree of ignorance. In the United States, under the conditions promoted by the stupid legislation inflicted on an unsuspecting public through the efforts of Anthony Comstock, the situation is beyond words.

The case of England has been exposed in a measure by the publication of 160 letters from working women collected by the Women's Co-operative Guild.[1] Here one obtains a glimpse of the working woman's view of what she is called upon to undergo in the way of enforced maternity. The 348 mothers from whose communications the 160 letters published were selected had borne 1,396 live children, and had experienced 83 still-births and 218 miscarriages. These letters form a record of intolerable suffering, nobly endured. Beyond the irreducible minimum of pain which is woman's cross, there is a story of poverty and desolation, of strain and overwork, of human waste, that would move the most hardened soul. But there is no bewailing, no cringing, no self-pity. If anything, there is too much stolid resignation to what is deemed inevitable.

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[1] *Maternity.* London: Bell, 1916.

These mothers were the wives of laborers of various grades of skill with incomes comparable in buying power to those of our own laborers below the grade of skilled mechanic. Their plight is attributed to the three causes, inadequate wages, lack of knowledge regarding maternity, and the personal relation of husband and wife. By the last phrase the writer appears to mean the generally inferior position of the woman in the household. Very likely this is a fairly correct analysis as far as direct causes go. These three undercurrents might well occasion all sorts of trouble, and something ought to be done toward remedying them. But let us assume that woman has been made the honored copartner with man in everything the law can give, that she is being given all the instruction in hygiene possible, and that her husband is receiving the whole reward of his labor according to his productive efficiency. Does this solve the problem? It does not. Domestic relations may be ideal, sanitary conditions perfect, and wages at the peak of possibility; but if the mother is to have pregnancy after pregnancy at unthinkably short intervals, she cannot keep her strength or develop her personality, she cannot bear healthy children or give them the proper care. It is impossible to evade this truth, or hide it by a subterfuge. The reasoning is too direct and simple.

The same conditions hold in this country, except that they are magnified because of our mediæval laws. I have had occasion to examine a small sample of a hundred or two letters taken at random from among the thousands of pleas to be relieved of excessive child-bearing addressed to some of our "Welfare" societies. Their tales of ill health, of toil and drudgery, of shrunken bodies and blighted souls, of children sentenced at birth to death or, worse, perhaps, to hopeless lives, are tales of shame to the country which permits the necessity of their being written.

The thesis here set down might be more effectively sustained by quoting from some of these letters, were it desirable merely to stimulate the moral affections. But this is as unnecessary as it is inexpedient. One does not need to have access to the files of benevolent associations to become acquainted with the truth in this matter. The federal Children's Bureau has published some scores of careful investigations into the conditions surrounding mothers and children in the United States. Those who read these reports will find that they are often shocking. The bureau admits them to be shocking. And where they are most terrible, three things always go together; there is too little income, too little knowledge, and too many children. The advice given is pathetic. If we can only do away with this squalid poverty, with this fearful ignorance, they say, the millennium will come. On the third point they are silent, and one feels that the writers must blush at being thus silent on what is patently the most salient point of all. It is not their fault. Our paternal government bids this silence. As Mary Ware Dennett has pointed out in one of her emphatic pamphlets, it is proper for one of our scientific government bureaus which deals with agriculture to give directions for growing prize-winning corn by *spacing* the plants *correctly*, but improper for the government bureau which deals with mere human beings to give the same directions. "The Children's Bureau," she says, "is free to give endless information to the poverty-stricken mother about baby-feeding and prenatal care, but it cannot tell her how not to have a rapid succession of feeble babies, each one further draining the mother's vitality and competing vainly with its brothers and sisters for a cruelly scant food-supply. The irony of instructions on baby care under the circumstances is grim."

Turn over the pages of any newspaper and read about the families for whom aid is asked. Examine them particularly during the pre-Christmas campaign when they strive so hard to furnish American femininity with the dual satisfaction obtained through a sob-relief followed by the joy of giving. The details are different; and the reporters, in response to their own sense of the dramatic and the demand of the public, select the most varied themes; but in spite of this effort the record is monotonous. By actual count, 60 out of 100 taken as they came were cases where Nature ruled and too many children were born to unfit parents. Numerous children born in rapid succession and doomed to malnutrition, a broken-down mother, and a father of low-earning power, unless indeed the family has been robbed of his services altogether by disease, desertion, or death, is the prosaic description fitting one after another.

This brief glimpse of affairs in England and the United States shows that a considerable proportion of the population, how great no one knows, does not regulate the family in accordance either with earning power or physical strength. In all other phases of existence the heritage of a high civilization is at their command, but in the matter of reproduction they are in the same situation as are unthinking, irresponsible animals of the lower orders. Is it any wonder that the Bluebird of Happiness flies away from such homes? Babies to bring joy to the home and strength to the nation must be welcome babies who do not drain the health of the mother and who are themselves "well born." As Doctor Stopes says, what happiness can be the portion of a frightened and soul-sick woman who is weakened annually, who despondently gives what she can, with a toddler at her knees and an infant in her arms, and who sees the savings and the labor which went into the making of the tiny clothes enshrouded soon in the little coffin for which she pays in tears and sadness? What is the lot of the man who has reached his maximum earning capacity, who must face the prospect of an almost annual baby coming to increase the strain on an already overburdened wife? He "becomes discouraged, moody, panic-stricken, a prey to fear, which unfits him to take his place as a productive member of the community, and renders his mind receptive to any propaganda, however destructive or hysterical, which seems to offer the way out."

Such evidence as this is recorded in hundreds of thousands of cases. Who is to say that it is worthless because it treats of persons instead of abstractions?

The partial cause of this situation in the United States is the federal law passed in 1873 through the efforts of Anthony Comstock with the practical effect of making it a crime to advise the limitation of families even where parents can give their children no hope but the hope of death, no opportunity but the opportunity to become diseased. Some day this law will lead the list of barbarisms committed by supposedly civilized peoples, taking precedence over the English mutilations and death penalties for petit larceny and the legalized witchcraft assassinations of our own colonial days; but it stands on the statute-books now, marking us to the world as a backward nation. To be sure, it is a dead letter for the majority of the educated and the well to do. Judged by the size of their families it is broken with impunity by the hypocrite who defends it, the lawmaker who refuses to repeal it, and the justice who is appointed to uphold it. But the poor suffer. And not always only the poor. I have read letters from intelligent educated mechanics, tradesmen, and merchants, from the super-educated who possess sheepskins ornamented with a college degree, and even from physicians, who knew less about parenthood from choice than the average Bantu negro submerged in Central Africa.

This is a partial cause, but not the whole cause, of the trouble. There is also cynical indifference in various quarters. In 1881 New York passed a statute making it legal for physicians to give contraceptive information as a health measure. The result of this forty-year experience was tested by Doctor Mary Holton in 1919 by an inquiry on the subject in thirty hospitals in Manhattan. Selecting five diseases, tuberculosis, organic heart affections, chronic kidney disease, cancer, and venereal infection, as typical diseases where there is grave danger of pregnancy resulting in the death of both mother and child, Doctor Holton asked if instruction were given as to proper methods of preventing exposure to risk. Although these hospitals often perform therapeutic abortion, although major surgical operations made necessary by childbirth are commonplace, the answer to her question in each and every institution was "no." The truth is, these physicians and surgeons had not even taken the trouble to discover the existence of this law.

There is no end to what one could say along these lines if it were desirable, but there was no intention of arguing the question of whether it is proper for human beings to control their destiny in reproduction as in other important matters. This was assumed to be an axiom to which every rationalist would agree. The only point of these few paragraphs is to show that ignorance in this regard is still very wide-spread, that it remains wide-spread because of unjust and illogical laws, and that extended suffering, particularly among the poor, follows this ignorance like a shadow. The real discussion turns on the possible result of the removal of this ignorance.

The race-suicide bogie need disturb no one. There is a small percentage of short-sighted eccentric people, both men and women, who do not desire children. Unless their peculiar turn of mind is the result of a definitely abnormal psychic complex, which is sometimes the case, they live to repent in sackcloth and ashes—when too late. The number of such cases, however, is negligible. Most people want children. They want them because there is an age-old parental instinct which urges them on, an instinct which is a heritage from infinite generations of the past and which is presumably strengthened by selection in each generation, an instinct whose antithesis tends toward extinction because those who have it are doomed to leave no progeny. And further, they want children because of the personal joy attached to their possession. An eminent physician once said that in his experience every one ardently desired the first child, nearly every one the second, the majority the third, few the fourth and fifth, and no one the sixth. This may be stretching things a little at both ends, but there is no doubt of its approximate correctness.

Reproduction is of course a natural process attended with a certain degree of suffering for the mother and of care and responsibility for both parents. It can never be otherwise. The trouble is that the student of social problems, regarding it as part of the general life-history of an individual, is sometimes inclined to believe that it involves no problems. Yet it would seem to follow that overindulgence in reproduction may be attended with ill results as commonly as when some other ordinary body function, such as digestion, is exercised too heavily. Yes, reproduction has its problems, and they are problems so easy as to make it impossible not to draw approximately the correct conclusions *a priori* and so difficult as to make it almost impossible to give them rigid demonstrations.

The birth of at least one child under proper conditions is probably a beneficial experience to every woman, both physically and psychically. This conclusion does not come as a general biological deduction, for in numerous lower species death follows reproduction immediately; it is merely the general consensus of medical opinion drawn from a multitude of observations. To some extent it is corroborated by statistics. Married women live longer than single women, and mothers live longer than the childless. But since there is one selection of healthier individuals in favor of wives and another in favor of mothers, it is doubtful whether the longevity differences discovered among these categories have any significance. One had better rest content with what the physicians have to say.

Powys[1] has endeavored to go further on this point and answer the question of how many children a woman may have without detriment to health. He found that in New South Wales those mothers lived longest who had borne from five to seven children. But here again enters that common statistical difficulty which makes it almost impossible to restrict the inquiry to the point at issue. Data from other sources make it probable that cause and effect were here reversed. Women did not live long because they bore from five to seven children, but they were able to bear this number of children because they came from strong, long-lived stocks.

Broadly speaking, however, this is a subject to be dealt with individually rather than by averages. Opinions have changed since old Martin Luther's neurotic doctrine that woman's chief purpose here below is to bear as many children as possible even if she dies from it. Speaking only from the standpoint of the mother without regard to the welfare of the child, there assuredly are women who ought to remain childless; others can bear with impunity only one, two, or three children; a few may be able to cope with families much more numerous. There are physical malformations and both organic and infectious diseases which make childbirth unwise. If they are congenital, motherhood may not be warranted at all; if they have arisen during life, it will depend upon circumstances what degree of motherhood is proscribed. It thus should be wholly a question of personal decision on the part of the woman, after adequate medical advice. Whether authoritative sympathetic counsel can be obtained from any large percentage of our physicians and surgeons is another matter. The trend is for the better, but the current situation is far from satisfactory. In even the leading medical schools, not only are the departments of obstetrics less progressive than other departments, but there is a disturbing tone of professional secretiveness connected with questions of maternity, partly due to deficient training in the subject, partly due to prudery, which is just as current in medical circles as elsewhere, and partly due to that mediæval set of guild rules known as medical ethics. It will take time for these changes to take place, particularly in the last item. The late Doctor E. E. Southard, distinguished for his psychiatrical work, once asked me what course of study I thought it would be desirable to add to the Harvard Medical School. I replied, jokingly, a course in ethics given by a layman. Now, on second thought, I recommend it seriously; not that the physician is less ethical than his fellow man, but because his code is established from one point of view. Since it is a kind of sacred writing to him, the young doctor doesn't appreciate the humor in terming a code of ethics that little guide to propriety issued by the American Medical Association, filled with trade-union rules designed to promote dignity and prosperity in the profession. It would not hurt him a bit to learn the private view-point of the layman in regard to the responsibilities of his profession.

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[1] Powys, A. O., *op. cit.*

Finally, there is the frequency of conception in its relation to maternal health. This subject is usually discussed as a child-welfare problem, but it must not be forgotten that if too frequent child-bearing affects the little ones adversely, as all authorities agree, this can only be through the condition of the mother as a direct cause. And even Napoleon admitted that the life of a mother is more valuable than the life of a babe. She has reached a period of usefulness the other may never attain.

Here again emphasis must be laid on the fact that Mother Nature is a cruel personage. She accomplishes her purpose by dark and devious ways when necessary. In reproduction she is manœuvring primarily for the survival of the species, and if the human female is only built strong enough for this purpose, nothing more is required. Woman, from the Stone Age onward until modern times, was usually worn out, old, decrepit, ready to die, at thirty. The decision that she could have another thirty years of activity, a second career as a new personality after the duties of motherhood were over, is a very recent acquirement of civilization. And, as in several other cases, this discovery is a manifest improvement over the natural order of things. Along with this change have come others. With less stringent selection Eve has become somewhat less rugged, though in the world at large she is still by no means fragile. She lives less violently, perhaps; at least, we know that she lives longer. And in the meantime, in ever greater numbers, she is unable to feed her offspring in the manner ordained in the evolution of the mammals. Thus an artificial civilization has brought about two great alterations in the feminine outlook on life; woman can have a productive, efficient career as an individual citizen, if she takes care of herself; but if she looks after her health, and is in fact a robust, persistently fertile type, her risk of successive pregnancies at less than the original rudely designed "natural" interval is greater than ever.

The peril of this situation is obvious. Nature built up an intricate mechanism whereby the human female animal became a mother at about fourteen years of age, nursed her babies through two years of infancy, bore from five to seven children at intervals of about three years, and was a decrepit old hag at between thirty and thirty-five. The science of civilization has changed this female animal to a woman, a woman who can do her duty by the race and still compete with man in lines he previously made his own. The change is good. Only, if science presumes to interfere at all, it must interfere in every way that knowledge dictates. Hence it follows that the meagre advantage Nature gave to woman in the way of regulating reproduction, and of which she has been robbed, must be restored in another way.

There is a large body of evidence in the literature which goes to show that a high percentage of the women of to-day in civilized countries is persistently fertile. Successive pregnancies occur for from ten to twenty years at intervals of between eleven and eighteen months. Numerous records exist of from four to seven children born at an average interval of eleven months. Furthermore, in families where infant mortality is high, the interval often decreases over what it would be otherwise. This is too short a time. If the savagery of a natural order gave woman between two and a half and three years to recover her strength before again becoming a mother, civilization ought at least to do as well. We must not be led into the fallacy of thinking that modern woman can withstand a greater drain on her strength than her earlier ancestors because of her so-called sheltered life. She may have less strength to draw upon, and she may be facing as great hardships under our civilization with its requirements of education and type of living as her wool-carding ancestor ever faced with hers. I would go farther and say that civilization ought to do better than Nature. In the artless order of things woman was provided just enough strength on the average to get from one childbirth to another. No more could be expected. But we ourselves, who take pride in our mastery of the organic and the inorganic, ought to show a little beneficence and benevolence by recourse to voluntary parenthood where the individual case can be treated on its merits.

The remaining matters relating to maternal welfare can be treated in connection with the welfare of the child.

Few of those not professionally interested in the study of heredity realize the number and frequency of hereditary abnormalities in the human race. Laughlin[1] has recently compiled a list of about 200 pathological conditions known to be transmissible. They include pathological types of nearly every well-known organ in the human body. The skeleton, the eyes, the ears, the circulatory system, the nervous system, and the reproductive system are especially likely to be affected. The frequency of affection is not easily estimated, but after a careful study of the available data I should be inclined to say that fully 10 per cent of the people of the United States ought never to become parents if a reasonable degree of care is to be exercised in breeding a mentally and physically sounder race. Only a limited number of these people will ever be cared for in benevolent institutions, and thus be restrained from reproduction by segregation or by official sterilization. No other just course seems available, therefore, than to instruct physicians carefully in human genetics, and thus to promote their efficiency as advisers against procreation when the facts warrant. For the rest of the population it is a matter of limiting reproduction to such a degree and at such intervals that the children will have a reasonable opportunity to grow into healthy citizens educated in accordance with their capacity.

Infant mortality studies, certainly a very sensitive index of domestic conditions, show very clearly the adverse effect of large families on the children. In the compilation made by Lucien March[2] from the records of French civil employees, 1901–1907, there is a regular increase of the infant deathrate from 114 per thousand among the first born to 277 among the twelfth born and over. The ratio for the second, fourth, sixth, eighth, and tenth in order of birth were 122,

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[1] Laughlin, H. H., "Eugenical Sterilization in the United States," *Rpt. Psychopathic Lab. Mun. Court*, Chicago, 1922.

[2] March, L., *Commission de la Dépopulation. Sous-Commission de la Natalité. Rapport sur les causes Professionelles de Dépopulation.* Paris, 1905.

148, 173, 204, and 236 respectively; and since 89,400 births were included the results can be accepted with some confidence, although in all probability size of family *per se* was not the sole contributing cause.

In Doctor Alice Hamilton's[1] study of infant mortality among 1,600 children born, the rates in families classified according to the number of children were as follows: 4 children or less, 118; 6 children or more, 267; 7 children or more, 280; 8 children or more, 291; 9 children or more, 303 per thousand. Unfortunately, the numbers are inadequate and other variables not well controlled; but it is fair to say that a significant relationship between large families and high infant mortality holds, even though it may not be of the magnitude here indicated.

Similar comments may be made on the study at Johnstown, Pennsylvania, reported by Miss Emma Duke.[2] The number of births investigated was 1,491. The infant mortality rates were 138 for first and second children, 143 for third and fourth children, 177 for fifth and sixth children, 182 for seventh and eighth children, and 201 for ninth and later children. There were only 91 births in the last category.

Such figures, which could be cited more extensively if necessary, make out a fair case for the statement that large families and hardship within the family are too often matters of cause and effect. They do not tell the whole story, however. Any one who takes the trouble to follow a few case histories will see that after four or five pregnancies the weaker mothers tend to be eliminated from the ranks of the child-bearers. Pathological conditions are developed which cause sterility, or the matter becomes so serious that some means is found of keeping the stork in his place. Hence only the strongest and most robust mothers, with records of comparatively low infant mortality rates, remain to fill the niches left in the records for extremely large families.

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[1] Hamilton, Alice, "Excessive Child-Bearing as a Factor in Infant Mortality," *Proc. Con. Prevention Infant Mort.*, 1909, pp. 74–80.

[2] Duke, Emma, "Results of a Field Study in Johnstown, Pa.," *U. S. Children's Bureau*, 1915.

These conditions are evidently the result of a complex of causes. As Hibbs[1] says: "Those parents who bring into the world larger families than their neighbors deem themselves able to rear properly are frequently improvident, with a low standard of life, and, in addition, are often characterized by a lack of intelligence or of sufficient knowledge of the simpler laws of hygiene." To deny the interweaving of these conditions, and of others which might be mentioned, would be foolish. The destruction of the poor is not wholly due to the wicked capitalist who compels them to live in poverty, therefore; it is due to lack of intelligence, which depresses their productive value to society, and to the ignorance which results in their dividing their meagre possessions among many instead of among few. An absolutely just wage distribution would not raise the average income of our submerged quarter by any large figure. This is demonstrated by the complete income figures for the United States, which are now available. A reduction in size of these families would not raise their intelligence. But poverty per capita, which is the only reasonable way to estimate poverty, would be reduced; and the intelligence which happens to be their heritage could be exercised in concentrated doses toward raising the family to a higher plane.

This reminds me of the eminent Doctor Newsholme's[2] imposing opinion that "large families evidently do not necessarily imply a tendency to high infant mortality. The connection often observed between a high birth-rate and a high rate of infant mortality probably is due in great part to the fact that large families are specially exposed to the degrading influences producing excessive infant mortality." Exactly! Infant mortality advances *pari passu* with the size of the family, because large families generally cannot avoid the conditions affecting child life adversely. What a circumlocution this is.

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[1] Hibbs, H. H., *Infant Mortality*. N. Y.: Russell Sage Foundation, 1916.

[2] *Cf*. Hibbs, H. H., *l. c.*, p. 44.

Another important phase of this social problem, the possible relation between the length of interval between pregnancies and the health of mother and of children, has been seriously neglected. That is to say, we know that in civilized life the natural interval is often reduced, but we have not been able to measure the effect accurately. The Children's Bureau is now doing something in this connection, and Doctor R. J. Ewart[1] has published several articles on the subject. Ewart has been especially interested in the children, and has measured the development at the end of the sixth year in 800 English boys and girls who were born at different intervals after the previous child. Where the birth interval was less than two years, the mean height of the child was 38.6 inches and its mean weight 37.2 pounds; where the interval was three years or over, the mean height was 41.7 inches and the mean weight 39.4 pounds. The heights and weights of those born at intermediate intervals were also intermediate. To any one who has had experience in watching the development of an organism, whether it be a boy, a calf, a silkworm, or a young plant, these facts mean much. The child is father of the man. The conditions promoting or inhibiting early development are much more important than those it will meet later on in life. The child who is given a healthy start in infancy and early childhood will be given a handicap in the race he runs which he will never lose. Doctor Ewart remarks that where "the birth interval is so short that the mother is unable to bring her whole vitality to bear, one child, as it were, spoils the next."

Even without many quantitative data on this subject, common sense tells us that the minimum interval between pregnancies must be unfortunate for both mother and child. To the mother it is both a physical and a psychical hardship. To the child it is a many-sided destructive force. It does not receive the optimum prenatal environment, though to be sure Nature takes most of the toll from the mother; and it does not obtain the proper postnatal care, since the decreased strength of the mother, combined with her increased duties, makes this impossible. And there is the further fact that in preparation for the newcomer, breast-feeding must cease; which raises the chance of death of the nursling by at least 25 per cent.

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[1] Ewart, R. J., "The Aristocracy of Infancy and the Conditions of Birth," *Eug. Rev.*, 3: 142–170, 1911. "The Influence of Parental Age on Offspring," *ibid.*, 3: 201–232, 1911.

With what has been said earlier on infant mortality in its relation to social conditions, this résumé gives a brief glimpse of the necessities of protecting mother and child, particularly among the less fortunately situated. It should hardly be necessary to emphasize again the kind of protection they need. There can be no objection to infant welfare centres where all sorts of instruction in prenatal and postnatal care are given, and where itinerant nurses and physicians are supplied. This is a very desirable type of public health work, which can be justified economically as well as morally, for it aids in controlling a source of economic waste. Maternity benefits may also be desirable, if carefully designed, though the unguarded financial consideration which is usually proposed is both unsocial and dysgenic. And such adjustable social iniquities as remain ought to be straightened out as fast as possible. These things will contribute their mites. But the indispensable requisite for reform is obviously *voluntary parenthood.*

After the direct and the circumstantial evidence as to the evils of uncontrolled parentage, of which only a meagre sample has been presented, who can doubt that wide-spread rationalization of parentage will aid greatly in cutting down maternal and infant mortality, will effect a reduction of congenital defectives, and will lower the frequency of many diseases? Is it any more to be questioned that abortion will become less common when the incentive is removed, and that the more or less fixed income to which most families are chained will be more effective in providing culture and promoting happiness when spread less thinly? Will not child labor also gradually disappear? If these important questions are answered satisfactorily by neo-Malthusianism, there should be little reason for the progressive person not to range himself or herself with the proponents in the case. But there are some further relations between voluntary parenthood and social conditions which ought not to be left out of consideration. They are perhaps subsidiary matters, which on the principle of the greatest good to the greatest numbers ought to be given little weight; but at the same time they are matters in which many people are interested.

Reference is not made here to theological objections to birth-control. These are articles of dogma which are not subject to intelligent discussion. It is not profitable to argue about taboos. Such things need time to right themselves. Nor is there any necessity of discussing the possibility of promiscuity being promoted by neo-Malthusianism. One may simply say that a morality prompted and sustained by fear is not worth very much. Penologists have discovered what weak deterrents to crime were the cruel and severe punishments of long ago. What I refer to is the effect of voluntary parenthood on the solidarity and the economic value of the family. Under current politico-social systems the stability and the efficiency of the family are matters of real importance. Students of government are in general agreement that the peaceful fireside is an essential requisite to national greatness.

The term "solidarity" has been selected with care. I have no sympathy with the idea that political unity and national progress are promoted by insisting on marital permanency at all costs. Rather should one insist on conditions which bring about individual comfort and happiness. Such conditions, in the long run, will tend to strengthen family ties; but they may, or they may not, tend to lower the frequency of divorce.

In the absence of real knowledge, it is hazardous perhaps to make predictions; but there are several cogent reasons for believing that freedom from involuntary parenthood will do a great deal toward making marriage more of an idealistic copartnership. For example, the number of abandoned families should be diminished materially. Few persons realize how frequently an overabundance of babies is the direct cause of wife desertion. Only our social workers know the truth. They see the hopeless conditions brought about by uncontrolled fecundity so often that their real wonder is not at the occasional failure of monogamy, but rather at its unusual success. Again, the age at marriage may be expected to decline. The young man starting out to make his way will not be required to wait for a competency before he sets up his household. This might sometimes lead to ill-advised, hasty marriages, but in general such disadvantages would be more than offset by the ease of mutual adjustment inherent in the young. In fact, Forel[1] makes out the specific advantages of early marriage to be rather numerous. He feels that the state will benefit on the economic side, that morality will gain from the decreased demand for commercialized vice, and that the individuals will profit by generally increased health and the decline of nervous affections of various kinds and degrees. If Forel is correct, control of parenthood would have a stabilizing effect on marriage which cannot be lightly denied, and he is a man who has had as wide an experience in neuropathology as any living physician.

If one grants the beneficial effects of neo-Malthusianism on the physiological side, moreover, it follows that it must have a similar value on the economic side. Every business executive knows how rapidly the efficiency of the young man increases after marriage. His ambition is stimulated and he applies himself with all his energy in order to better his position. He realizes and accepts a new responsibility, and is not continually shifting about from one employer to another. For this reason earlier marriages should raise the returns of industry. Contented married life, should that be promoted, would act in the same way. Not only would man's productive power be enhanced by his better physical condition, but also by his mental state. A wholly care-free existence is certainly not to be desired; but nothing prevents one from concentrating on what he has to do more quickly and thoroughly than continued worry. If haunting, harrying domestic fears give place to hope and contentment, it will have a value which can even be measured by a sordid dollar-and-cents criterion. Finally, one cannot easily refuse to admit the changed economic status of the wife under this system. She may not wish to go into gainful employment more often than at present; and it probably would not be advisable, even if she so desired, except possibly for the first year or two of married life, as recommended by Forel. It would permit her to help out the family exchequer when unforeseen, exceptional circumstances arise, but even this is a negligible advantage. What would happen is the elimination of a significant proportion of the economic waste which now ensues from the preparation for and care of children who sicken and die before they reach the age of shifting for themselves. This is a manifest loss to the parents concerned and to the community; and if infant and child mortality can be reduced by doing away with haphazard parenthood, as presumably it can, admittedly there will be a resultant gain.

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[1] Forel, A., *The Sexual Question.* N. Y.: Rebman, 1908.

We have touched on the more important facts connected with population restriction and the welfare of the family. Obviously some of the problems involved are still unsettled, and will remain unsettled until they are investigated much more thoroughly and critically than they have been up to the present time. Nevertheless, logic and reason, as well as the evidence at hand, point unmistakably to the conclusion that a generally restricted population brought about consciously and deliberately with the prevision of intelligence and wisdom has many things to recommend it and few to condemn it. The reader can draw his own deductions as to just how strong the case is. It must rest on a firm foundation of concrete evidence cemented by valid reasoning or fall to the ground, but one must not make the mistake of thinking he shows a well-developed judicial faculty in requiring a superabundance of facts. One critical demonstration of a theorem is often as good as a hundred.

CHAPTER XII

IN CONCLUSION

One may scarcely hope to present a short sketch of a great subject without committing sins of omission and commission which give the opportunity for misunderstanding. Nor can these sins be rectified, any more than those of the family doctor, by a *post-mortem* examination. Nevertheless, a few final pages of explanatory summation may serve to weld the stray fragments of argument into a more or less consistent whole. The minor issues will be neglected.

The case is built on the simple premise that man is an animal, a highly cerebrated animal it is true, but still an animal. Being an animal, he is therefore no angel. He hopes to become an angel eventually, but he certainly is no angel now. Yet he struts around, planning his comings and goings, as if self-hypnotized into believing this idealistic state to be an accomplished fact. This unfortunate assumption breeds trouble. It is comparable to fighting the physical maladies of humanity with the formula "there is no sickness, disease is a state of mind." The attitude of orthodox medicine with reference to disease—recognition, study, cure—is much to be preferred. Similarly, I feel that if students of political science had a more intimate acquaintance with biological principles and made greater efforts to adjust politico-social practice with them, the change could be productive only of good. They would realize more fully the difficulties under which the human race labors if they were thoroughly familiar with man's genetical history; and they might make it possible, by the removal of temptation, for the aforesaid race in some measure to approach Golden Rule ethics, which would be immeasurably better than the current practice of reading it on Sunday and neglecting it throughout the week.

We are often warned of the danger of trying to apply the knowledge gained in one sphere to a wholly different sphere without recognizing the possibility of a severely limited application. But this warning, if it has any just claim to soundness, is valuable only in so far as it calls attention to the homœopathic character of our knowledge in any one department. It cannot form the basis of an excuse for wrapping our discoveries in a napkin. There is very little difference of opinion among professional biologists as to what principles are sufficiently well grounded to make them worthy of extended use. There is probably more unanimity of opinion, for example, regarding the basic laws of evolution, of instinct, and of heredity, the laws whose recognition would be so valuable to politics, than there is regarding the fundamental principles of medicine or of agriculture; yet the former are tacitly disregarded, while the latter are utilized almost to the full extent of their possibilities.

Warning of the perils of half-knowledge would be more to the point. Gilded ignorance is indeed a dangerous thing, and those who are cursed with it are as active as a pestilence. An ever-increasing number of well-meaning persons read a page or two from a biological encyclopædia, and are so surprised by the changed outlook it gives them they forthwith see the answer to every problem immediately. American publishing houses have put forth numerous volumes during the past two years in which politico-biological theses are laid down that are unsound in nearly every line. Sincerity, however, covers a multitude of sins; and one can forgive the half-baked propaganda of the veriest amateur on this account, for from it the sieve of time may ultimately extract some wheat. One is at a loss to know why these people do not prepare themselves adequately for what they attempt, but after all the mere fact of the attempt at helpfulness has its hopeful aspect.

Belief in the supreme power of truth, the confession of faith of the man of science, holds within it the essential elements of a dignified religion. He who retains it cannot be disheartened by errors and mistakes. In the efforts toward biological reform of social and political conditions, mistakes will no doubt be made in plenty; but there is no reason for condemning the lessons of biology because one does not understand them. Disraeli's maxim, "ignorance never settles a question," is worth keeping in the forefront of our memories.

This sermon must find its excuse in the wide-spread reaction against all biological philosophy which is current to-day as the direct result of the tenets of the German militarists. The reactionaries, their heads plunged in the sands, quiver with indignation because the Junker ideals were so definitely opposed to their own subjective fancies of what ought to be. In part, they say that if this cruel doctrine is what comes from accepting the evolutionary point of view, they will have none of it; and in part they set up a creed of progress by co-operation, to oppose what they call the "crude" interpretation of Darwinism as a contest of tooth and claw. Neither of these two attitudes is intellectually worthy of thinking beings. The biologist is just as desirous of seeing peace and good-will on earth as another; but he does not feel that this is promoted by remaining oblivious to existing facts. The behavior of the major portion of the world during and since the war is a complete demonstration of the absolute truth of the fundamental assumption of Germany, the dominance of self-interest. If the United States has been seemingly a little less grasping than some of the other nations, the strength of her economic position is what has made her so. With 200 millions instead of 100 million people she would not have had the least hesitation in matching wits—or swords—with England and France for the African spoils of war. The best way to deal with the problems made so acute by man's hereditary instincts is not to deny or to ignore them, but to find out how to make the best of the matter. Judging from past experience it avails little to hold a loaf of bread before the eyes of a starving man and to preach impressively to him on the impropriety of stealing. It is more expedient, and probably as productive of moral development, to prevent his reaching a famished condition.

Though the biological point of view should not be overlooked in any human problem, in none is it so essential as in the old Malthusian problem of population, the spectre of a century ago, with which people finally attained such a casual familiarity their terror gave way to contempt. The reason is obvious; here one has man's two primary urges working at cross purposes, an unnecessarily high fecundity bringing about a growth of population which makes the individual struggle harder and harder. Nothing could be more dangerous than the false sense of security which has developed on this subject, built upon those shifting sands the temporary profits of industrial development. Man has seen the evil consequences of local overpopulation fade away like morning mists before the rising sun, and in his growing sense of power he has laughed at the voice of caution. He has pushed out into the thinly settled portions of the earth and has subdued them rapidly—too rapidly for his own good. He has obtained extraordinary agricultural returns for careless, inefficient labor on these fertile virgin soils, thus providing food for the more densely settled regions; and the people of these regions have been lulled to sleep by an entrancing mirage of plenty. As a result the zephyr of population growth has become a whirlwind. Man in his strength has brought down the pillars of Gaza on his own head.

The peril of being beguiled by the easily obtained low yields of new land now becomes apparent. Greater hordes have appeared in the regions where the excess went and greater hordes have appeared in the regions from whence it came, thus the supply has shrunk at double pace. The vacant spaces of the earth are filling fast, and the utmost yield is needed on each unit of arable land. Moreover, when the land is filled man's urge for self-preservation will be just as great as it ever was. He may sublimate it to some extent, but it will be there, an elemental character of his protoplasm, ready to show when sufficiently stimulated; and it will be stimulated more and more frequently as the struggle becomes keener and keener. At the worst, it will provoke repetitions of the recent great conflict; at best, it will show as an economic battle, with the physical results less catastrophic perhaps but fully as deadly.

Manifestly, the only relief for the situation is to call a halt on population growth at a point far below the final subsistence limit, at a point in fact where there is no intense struggle for mere existence; and the only means of accomplishing this feat which recommends itself to the ethically inclined is conscious, deliberate control of fecundity. It is no real solution of the difficulty simply to endeavor to raise the food-supply and thereby to increase the number of individuals the earth can support. The vessel is somewhat elastic, it is true, but it is a closed vessel nevertheless. Enhanced efficiency and prudent conservation of resources are means of bringing about increased happiness only if numbers remain constant.

One cannot emphasize too often the reasons why there is an immediate need for putting this remedy into practice. The fertile portions of temperate Asia and the major part of Europe are already overpopulated when measured by the present standard of agriculture. They have become overpopulated and remain overpopulated largely because the western hemisphere, Africa, and Australia are underpopulated, and can ship them food. But North America is entering the stage when exportation of food is no longer possible; Australia will reach the same stage within a few decades, and temperate South America will follow Australia before the present generation passes on. Thus within half a century presumably, within a century certainly, each country must prepare to live upon the fruits of its own agricultural efforts. And colonization and development of the tropics will not save the situation, or even delay the day. The difficulties to be surmounted in conquering them will make the work go slowly, and they will be able to take care only of their own increasing numbers.

Eventually this trend of events will bring about a new outlook on world economics. Food exportation from the younger countries will sink rapidly, as it did in the United States during the decade before the war, so rapidly that overpopulated countries will have the greatest difficulty in adjusting themselves to the change. They must accommodate themselves to the new conditions perforce, and so must all countries, for the high rate of natural increase current to-day will be impossible. Growth can be maintained only at a rate which parallels the enhancement of crop yields through plant breeding, pest-control, and scientific agronomy, a snail-like progress at best. Those who cherish the hope of a sudden extension of the allowance Mother Nature grants her children when this time comes are likely to be disappointed. There is no indication either in physics, chemistry, or the natural sciences of agriculture being able to profit by such radical changes as have occurred in mechanics. In the sweat of his brow, as always, will man gain his bread.

We achieved a rather ludicrous success by our efforts in the rôle of industrial-efficiency expert. Mechanical invention, by vastly enlarging the food return per unit of manpower without noticeably raising the return per unit of area, has merely served to shorten the time when the earth as a whole is saturated with people. It is a vicious circle. We raise more wheat to feed more men to raise more wheat to feed more men. We plant like Cadmus, the mythical founder of Thebes, who slew the sacred serpent of Mars, and, sowing its teeth, brought forth a harvest of armed men who fought each other to the death.

We can continue to circulate around this narrowly inscribed path at an ever-diminishing rate of speed if we wish. By strenuous effort the number of people the earth can support will gradually enlarge, even after saturation under a given state of culture, but the enlarging process will come slowly and still more slowly. We can do this thing. But is it worth while? Is it progress? Many persons believe it is. They maintain that only by strenuous competition, by facing utmost hardship, will mankind advance. No doubt they are right in some degree. Lives of ease and leisure do not promote the finest development of character. But is not the average man of to-day a struggler? With 1,750 million people seeking food, do many have time hanging heavy on their hands? They do not. Think then what will be the predicament of the great majority when there are 3,500 million people in the world, a number which at the present rate of increase would be counted before the year 2000. No! I cannot believe this is the wise procedure.

Let us look forward and draw a picture of the world as it would be at the end of the century with a continued expansionist policy. Food exportation had ceased some thirty years before, except for the exchange of specialties; all temperate regions had then reached the era of decreasing returns in agriculture. The tropics are being populated as fast as their submission to the hand of man makes it possible. Gradual reduction in population increase has occurred, due to the intensity of the struggle; yet there are 3,000 million people in the world. Migration has ceased; the bars have been put up in every country. Those nations where there is still a fair degree of comfort wish to retain it as long as possible. Food is scarce and costly. Man works from sun to sun. When crops are good there is unrest but no rest, there is privation and hardship; when crops are bad there is mass starvation such as China and Russia had experienced long before. Agricultural efficiency has risen 50 per cent during the past half-century through the pressure of stern necessity, yet the food resources of each individual are smaller than ever before. Where war occurs it is war of extermination, for only by extermination can the conquerors profit; where peace remains it is under the shadow of a struggle as grim as war. Morale has weakened, and with it morals. The death-rate has risen until it equals the birth-rate. *And the potential fecundity of the human race still remains at about* 60 *per thousand annually.* It is not a pretty picture, but I do not believe it to be overdrawn. It is a portrait of the China and India of to-day, and the China and India of to-day will be the world of to-morrow when the world as a whole reaches the same population status.

But, says one, though industrial progress may afford no permanent relief from the tendency toward overpopulation, ultimately there will be an equilibrium established through the gradual decline of human fertility. If this assumption were well founded, and *ultimately* were not too long a time, the future would be brighter; unfortunately, it is an unsupported subjective wish. Darwin long ago showed that civilization, instead of inhibiting the reproductive power, actually intensifies it. To-day it is probably greater than ever before, and there is no evidence whatever from which to predict a low ebb in the future.

Says another, the present trend of the birth-rate will soon set matters aright. But this supposition is no more in keeping with the facts than the former. One has only to look at the census returns for evidence. Generally speaking, the decline in the birth-rate, where there is a decline, is hardly keeping pace with the falling death-rate. On the average, the excess of births over deaths in such countries is greater to-day than it was half a century ago. The warnings in the public press on the perils attending the diminishing birth-rate can be attributed either to ignorance or insidious propaganda. The white race has to-day an excess of births over deaths of at least 12.0 and possibly of 13.5 per thousand of the population annually. Naturally there must come a point below which the birth-rate cannot fall without depressing population growth, but this point has been reached by only a very small fraction of the white population, and by none of the colored population. Among over two-thirds of the inhabitants of the earth the birth-rate is between 45 and 50 per thousand annually; and with most of these peoples there is little likelihood of its diminishing in the near future, unless it be with the Japanese. Since population growth at a rate of from 4 to 6 per thousand can be maintained indefinitely by a birth-rate of half this figure, one realizes how appalling is the waste of human life and energy.

Let us confine our attention to the probable sequence of events in the white countries, however, for in these countries our interest is centred. I believe it can be stated categorically that unless voluntary parenthood is taught to all classes of people by the governments of the various white nations as a serious, momentous public health measure, there will be no substantial change in the population growth of these countries until the comparatively sudden change of some 50 years hence necessitated by temperate-zone saturation. The white race holds a considerable quantity of fairly rich land which is not now very densely peopled, and the inertia of the present-day velocity will carry it to the danger-line, and probably beyond it. This is what makes the situation grave, from even the most sophisticated of Malthusian view-points. With agricultural efficiency mounting very slowly, with the small reserve of new land diminishing appreciably each year, with almost no effort being made to conserve soil fertility and therefore with a gradual loss of the most precious of our assets, with the small potential store of excess food vanishing like a candle burning at both ends because of the great population increase of the industrial countries on the one hand and of the newer agricultural countries on the other, there is likely to be a debacle which will turn the world more topsyturvy than the troubles of the last few years. If population growth were slow, there would be time for adjustment. With things as they are, difficulties are likely to loom suddenly, as ships in a fog. Of course there will be a few days of grace in which to set the house in order. There will be no sudden starvation succeeding a time of feasting. Nevertheless, the rate at which the world is going makes it not only possible but probable that the large margin of safety required by the immense number of people soon to be will be washed away more abruptly than any one expects. A sudden drop of 25 per cent in the grain-crop, just such a drop as has occurred time and again before, when there are 3,000 million people in the world will make what is left of them awaken to the folly of negligence.

If there were no other reasons, therefore, the preparedness motive ought to be sufficient to persuade other governments to follow Holland's lead in taking the voluntary-parenthood doctrine under their paternal protection, and to teach it in clinics as a measure of national insurance for both personal health and public safety. After a generation of such teaching Holland's natural increase is still as high as that of the United States, which shows there is no danger of a country suddenly vanishing through lack of an incoming generation; but Holland, through this method, is prepared in case the supplies in the larder should speedily be reduced.

This is the world question; it is a question of reducing a swiftly increasing population to fit a rapidly diminishing food reserve. But there is also the eugenic problem, that of endowing the next generation with better traits than were possessed by the last, or at least of not permitting them to become continually worse; and apparently it yields to the same solution as the other. To-day the finest families are hardly replacing themselves. The incompetent are taking their place. And this will continue should there be no eugenic reform until that point of equilibrium is reached where no more do-littles can be accommodated. There can be no real decay, the generally good heredity of the masses precludes; but there can be a very marked deterioration. Internationally conditions seem rather hopeless; nationally they promise better. We are a collection of fairly intelligent beings who occasionally listen to the voice of reason. Therefore an extended educational campaign ought to teach us that we cannot continue either to import undesirables or to raise them here. Education and then more education is what is needed. I do not mean more college and university training for those who can neither assimilate nor utilize it, but an education in the few little fundamentals that mean so much for racial progress, some of which cannot even be given legally to-day. Think of it! With mental disease increasing because of the high birth-rate of those who are tainted, with many physical abnormalities becoming more frequent for the same reason, with so much unhappiness, sickness, and uneasiness of soul coming as the direct result of over-many children, of too frequent child-bearing, there are legal obstacles in the way of that plain, simple instruction by the public health official in the physiology of reproduction which will so change the eternal order of things for the better.

If the human race really desires a continued progress, a fair chance, and a longer and happier life for every individual, the birth-rate must come down faster and faster; and it must come down throughout the whole population and not merely within the one section which furnishes those of greatest social worth. To accomplish this, parentage must not be haphazard.

Intelligent persons not wholly swayed by irrational tradition and emotional prejudice will be disposed to accept the idea of rational parentage as wholesome and proper. At the same time one should be under no illusion as to what is likely to be the immediate fate of a social scheme which requires an appreciative forethought by whole peoples, and not merely acceptance by the intelligentsia. No matter how much suffering could be prevented, no matter how much greater a civilization could be built by its application, its general adoption will probably await the compelling force of economic necessity. What else could be expected? Half the people in the world lack sufficient brains to cope with the intricate system of social life the industrial age has brought about. Half the remainder are without the proper training; they lack the power of knowledge. The remaining quarter, who might worthily direct the great majority, sit complacently as long as they are permitted to take an extra toll of the good things of life, and watch the direct control of the destinies of nations remain in the hands of those whose chief claim to the honor is the ability to emit those hollow words which fill *The Congressional Record* and the parliamentary debates. Knowledge is not wisdom. Knowledge to prevent the decay of our social fabric is not wanting; but it is a serious question whether there is the required amount of that type of ability which will make a sustained effort to apply it.

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